



L A K E M E A D
N A T I O N A L R E C R E A T I O N A R E A

Lake
Management
Plan

F I N A L
Environmental
Impact
Statement

V O L U M E T W O

Reader's Guide

This *Final Environmental Impact Statement / Lake Management Plan* documents the additions and changes made to the *Draft Environmental Impact Statement / Lake Management Plan* that was released to the public in April 2002. This final document is provided in two volumes.

Volume 1 contains the additions and changes to the draft document. The original text from the *Draft Environmental Impact Statement* is shown in black, while changes and additions to the draft are shown in blue. The exception to this is headings; both original and new headings are shown in black.

Volume 2 contains the public comments on the *Draft Environmental Impact Statement* and the responses to public comments prepared by the National Park Service (NPS) interdisciplinary planning team and the NPS contractor.

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**UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE**

**FINAL ENVIRONMENTAL IMPACT STATEMENT
LAKE MANAGEMENT PLAN**

LAKE MEAD NATIONAL RECREATION AREA

Clark County, Nevada, and Mohave County, Arizona

Lead Agency: Department of the Interior, National Park Service, Pacific West Region

This *Final Environmental Impact Statement / Lake Management Plan* tiers from the 1986 *Final Environmental Impact Statement / General Management Plan* and proposes additional management of recreational use for the waters of Lake Mead National Recreation Area. This plan describes four alternatives for managing the recreation area, including the management of personal watercraft, that would protect the resources and values of the park while offering recreational opportunities as provided for in the park's enabling legislation, purpose, mission, and goals. Each alternative represents a different mix of recreational opportunity zoning and associated carrying capacity, resulting in four alternatives that emphasize different recreational experiences and management strategies.

Alternative A, the no-action alternative, proposes to continue management under the direction of the current *General Management Plan*. Park managers would manage increasing use without providing a spectrum of recreational settings and a diversity of recreational activities. Improvements would be made only on an as-needed basis as funding becomes available. No rule would be developed for the continued use of personal watercraft in the recreation area, and personal watercraft would be prohibited. Required improvements for safety, facilities, conflict resolution, sanitation, litter, and resource preservation would be undertaken without a coordinated strategy and funding initiative. Alternative B would provide for the most primitive recreational opportunities for visitors. Compared with the other alternatives, greater limitations would be placed on motorized water recreation. All vessels powered with carbureted two-stroke engines, including personal watercraft, would be banned from the recreation area one year from the finalization of this plan. Vessels, including personal watercraft, using four-stroke or direct-injection two-stroke engines would not be affected. New facility development would be limited compared with the other alternatives. Restoring the natural shoreline areas is emphasized. Under alternative C, the *modified* preferred alternative, 5% of the park waters would be managed for semiprimitive or primitive use, and boating activities would be authorized to increase. Two-stroke engines would be allowed on the waters, but would be required to be in compliance with the 2006 Environmental Protection Agency emission standards within 10 years of the approval of this alternative or by the year 2012. Specific actions to address personal watercraft use, shoreline and boating conflicts, and litter and sanitation issues are included under this alternative. Alternative D, *the baseline alternative*, emphasizes growth with a corresponding reduction in the variety of recreational opportunities on the lakes. The waters of the recreation area would be managed for concentrated use with a greater percentage designated as urban park under the recreational opportunity spectrum, and no areas would be designated as primitive or semiprimitive. Personal watercraft use would be authorized in all waters of the recreation area. Marina and boat launching facilities could be increased, and shoreline restoration would be limited.

The potential environmental consequences of the actions are addressed under each alternative including impacts on natural resources, cultural resources, visitor experience, socioeconomic resources, and park operations.

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EXECUTIVE SUMMARY
FINAL ENVIRONMENTAL IMPACT STATEMENT
FOR THE LAKE MEAD NATIONAL RECREATION AREA
LAKE MANAGEMENT PLAN

DECEMBER 2002

PROPOSED ACTION

This *Final Environmental Impact Statement / Lake Management Plan* analyzes the impacts of several different alternatives for the long-term management of Lakes Mead and Mohave, the associated shoreline, and development areas within Lake Mead National Recreation Area to ensure the protection of park resources while allowing a range of recreational opportunities to support visitor needs.

PROJECT LOCATION

The analysis area is the lake and associated shoreline environment of Lake Mead National Recreation Area. At full pool, Lake Mead has a surface area of 157,900 acres with over 700 miles of shoreline, and Lake Mohave has a surface area of 28,260 acres and 150 miles of shoreline. Portions of the recreation area, including a 300-foot zone around the shoreline of both lakes, are jointly administered by the National Park Service (NPS) for recreation and resource protection and by the Bureau of Reclamation for project purposes and security areas at and around Hoover and Davis Dams. The Bureau of Reclamation manages the lake levels of both lakes. On Lake Mohave, there is an annual 15-foot water fluctuation zone between the lake elevations of 630 and 645 feet above mean sea level. On Lake Mead, the water fluctuation can be much more significant. Between 1992 and 2002 water levels fluctuated between 1,154 and 1,215 feet above mean sea level.

Lake Mead has four large subbasins, including Boulder, Virgin, Temple, and Gregg's Basin. Four narrow canyons, Black, Boulder, Virgin, and Iceberg, are located between these basins. The shoreline area includes several large bays, including Grand Wash, Las Vegas, and Bonelli.

NEED FOR ACTION

In 1986 the *Lake Mead National Recreation Area General Management Plan and Final Environmental Impact Statement* established land-based management zones and strategies for meeting the goals and general purposes of the recreation area. Since that time, management issues have surfaced that have not been adequately addressed or resolved in previous planning efforts. These issues relate to the increase in recreational use of the lakes, visitor conflicts and safety, potential impacts on park resources from water-related recreation, and personal watercraft use.

In 1992 park managers determined that the development of a lake management plan was necessary to address issues surfacing from increased visitation to Lakes Mead and Mohave. The planning effort was formally initiated in May 1993 when a notice of intent to prepare a lake management plan and environmental impact statement for Lake Mead National Recreation Area was published in the *Federal Register*.

Personal Watercraft Use Regulatory Background

More than one million personal watercraft¹ are estimated to be in operation today in the United States. Sometimes referred to as "jet skis" or "wet bikes," these vessels use an inboard, internal

1. Personal watercraft, as defined in 36 CFR §1.4(a) (2000), refers to a vessel, usually less than 16 feet in length, which uses an inboard, internal combustion engine powering a water jet pump as its primary source of propulsion. The vessel is intended to be operated by a person or persons sitting, standing, or kneeling on the vessel, rather than within the confines of the hull. The length is measured from end to end over the deck, excluding sheer, meaning a straight line measurement of the overall length from the foremost part of the vessel to the aftermost part of the vessel, measured parallel to the centerline.

combustion engine powering a water jet pump as its primary source of propulsion. They are used for [transportation and enjoyment and are capable of speeds in the 60-mph range. Personal watercraft were once the fastest growing segment of the boating industry and represented over one-third of all boat sales.](#)

The National Park Service maintains that personal watercraft emerged and gained popularity in park units before it could initiate and complete a “full evaluation of the possible impacts and ramifications.” While personal watercraft use remains a relatively new recreational activity, it has occurred in 32 of 87 park units that allow motorized boating.

The National Park Service first began to study personal watercraft in Everglades National Park. The studies showed that personal watercraft use over emergent vegetation, shallow grass flats, and mud flats damaged the vegetation, adversely impacted the shore birds that fed on the vegetation, and disturbed the life cycles of other wildlife. Consequently, managers at Everglades [National Park](#) determined that personal watercraft use remained inconsistent with the resources, values, and purposes for which the park was established. In 1994 the National Park Service prohibited personal watercraft [in the park](#) by a special regulation (59 FR 58,781).

Other public entities have taken steps to limit, and even to ban, personal watercraft use in certain waterways while national researchers continue to study the effects of personal watercraft use. At least 34 states have either implemented or have considered regulating the use and operation of personal watercraft (63 FR 49,314). Similarly, various federal agencies, including the U.S. Fish and Wildlife Service and the National Oceanic and Atmospheric Administration, have managed personal watercraft differently than other classes of motorized watercraft.

Specifically, the National Oceanic and Atmospheric Administration regulates the use of personal watercraft in most national marine sanctuaries. The regulation resulted in a court case where the court of appeals for the District of Columbia declared management specific to personal watercraft use valid. In *Personal Watercraft Industry Association v. Department of Commerce*, 48 F.3d 540 (D. C. Cir. 1995), the court ruled that an agency can discriminate and manage one type of vessel (specifically personal watercraft) differently than other vessels if the agency explains its reasons for the differentiation.

In February 1997 the Tahoe Regional Planning Agency, the governing body charged with ensuring no derogation of Lake Tahoe’s water quality, voted unanimously to ban all two-stroke, internal combustion engines, including personal watercraft, because of their effects on water quality. The ban at Lake Tahoe began in 2000.

In recognition of its duties under the [NPS Organic Act of 1916](#) and [NPS Management Policies](#), as well as increased awareness and public controversy, the National Park Service reevaluated its methods of personal watercraft regulation. Historically, the National Park Service grouped personal watercraft with all vessels; thus, people could use personal watercraft when the unit’s superintendent’s compendium allowed the use of other vessels. Later, the Park Service closed seven park units to personal watercraft use through the implementation of horsepower restrictions, general management plan revisions, and park-specific regulations such as those promulgated by Everglades National Park.

In May 1998 the Bluewater Network, a coalition of more than 70 organizations representing more than 4 million Americans, filed a petition urging the National Park Service to initiate the rulemaking process to prohibit personal watercraft use throughout the national park system. In response to the petition, the Park Service issued an interim management policy requiring superintendents of parks where personal watercraft can occur, but where they have never occurred, to close the parks to personal watercraft use until the rule was finalized. In addition, the National Park Service proposed a specific personal watercraft regulation premised on the notion that personal watercraft differ from conventional watercraft in terms of design, use, safety record, controversy, visitor impacts, resource impacts, horsepower-to-vessel-length ratio, and thrust capacity (63 FR 49,312–17, Sept. 15, 1998).

The National Park Service envisioned the servicewide regulation as an opportunity to evaluate impacts from personal watercraft use before authorizing the use. The preamble to the servicewide regulation calls the regulation a “conservative approach to managing personal watercraft use” considering the resources concerns, visitor conflicts, visitor enjoyment, and visitor safety. During a 60-day comment period, the National Park Service received nearly [1,800 comments on the proposed regulation](#).

As a result of public comments and further review, the National Park Service promulgated an amended regulation that prohibited personal watercraft use in most units and required the remaining units to determine personal watercraft appropriateness for continued use (36 CFR 3.24(a), 2000; 65 FR 15,077–90, Mar. 21, 2000). Specifically, the regulation allowed the National Park Service to designate personal watercraft areas and to continue their use by promulgating a special regulation in 11 park units, including Lake Mead National Recreation Area, and by amending the units' superintendents' compendiums in 10 park units (36 CFR 3.24(b)). The National Park Service based the distinction between designation methods on the units' degree of motorized watercraft use.

In response to the personal watercraft final regulation, Bluewater Network sued the National Park Service under the *Administrative Procedures Act* and the *Organic Act*. The organization challenged the NPS decision to allow continued personal watercraft use in 21 park units while prohibiting personal watercraft use in other park units. The organization also disputed the NPS decision to allow 10 park units to continue personal watercraft use after 2002 by making entries in superintendents' compendiums, which would not require the opportunity for public input in the rulemaking process. Further, the environmental group claimed that because personal watercraft cause water and air pollution, generate increased noise levels, and pose public safety threats, the National Park Service acted arbitrarily and capriciously when making the challenged decisions.

In response to the suit, the National Park Service and the environmental group negotiated a settlement. The resulting settlement agreement, signed by the judge on April 12, 2001, changed portions of the National Park Service personal watercraft rule. While 21 park units can continue personal watercraft use in the short-term, each of those parks desiring to continue long-term personal watercraft use must promulgate a park-specific special regulation in 2002. In addition, the settlement stipulates that the National Park Service must base its decision to issue a park-specific special regulation to continue personal watercraft use through an environmental analysis conducted in accordance with the *National Environmental Policy Act* (NEPA). [According to the settlement](#), the NEPA analysis, at a minimum, must evaluate personal watercraft impacts on water quality, air quality, soundscapes, wildlife, wildlife habitat, shoreline vegetation, visitor conflicts, and visitor safety.

In 2001 the National Park Service adopted its new management policy for personal watercraft. The policy prohibits personal watercraft use in **NPS** units unless their use remains appropriate for the specific park unit (NPS 2001c, Section 8.2.3.3). The policy statement authorizes the use based on the park's enabling legislation, resources, values, other park uses, and overall management strategies.

[On September 5, 2002, the National Park Service published a draft rule for the operation of personal watercraft at Lake Mead National Recreation Area. The draft rule for personal watercraft use is based on alternative C \(the preferred alternative\) in the *Draft Environmental Impact Statement / Lake Management Plan* \(which is the modified preferred alternative in this *Final Environmental Impact Statement / Lake Management Plan*\). The 60-day public comment period on the draft rule ran from September 5 to November 4, 2002.](#)

[The proposed September 16, 2002, prohibition of personal watercraft at Lake Mead was averted with the execution of a stipulated modification to the settlement agreement. The modified settlement agreement was approved by the court on September 9, 2002, and extends unrestricted personal watercraft use in selected NPS units until November 6, 2002.](#)

[The modified settlement agreement included a further extension of personal watercraft use at Lake Mead National Recreation Area until December 31, 2002, under certain restrictions. Certain areas \(zones 6, 7, 9, 15, 18, 23, and 24\) as identified in the *Final Environmental Impact Statement / Lake Management Plan* are closed to personal watercraft between November 7 and December 31, 2002. In addition, a 200-foot shoreline flat-wake zone would be established in zones 3, 4, 13, 14, 15, 16, 19, 21, and 22, as identified in the *Final Environmental Impact Statement / Lake Management Plan*. Under the modified settlement agreement, the National Park Service is required to evaluate the operation of all fueling facilities on Lakes Mead and Mohave. If a final rule is not published by December 31, 2002, personal watercraft would be prohibited until such time the final rule is published.](#)

OBJECTIVES IN TAKING ACTION

The overall objectives of this *Final Environmental Impact Statement / Lake Management Plan* are to improve the management of Lakes Mead and

Mohave to provide for the long-term protection of park resources while allowing a range of recreational opportunities to support visitor needs. This *Final Environmental Impact Statement* evaluates alternatives and strategies, including the management of personal watercraft, for protecting the resources and values of the Lake Mead National Recreation Area, while offering recreational opportunities as provided for in the park's enabling legislation, purpose, mission, and goals.

ISSUES

Internal and external scoping, public meetings, and the previously discussed settlement agreement served to identify several environmental issues that should be addressed in this *Final Environmental Impact Statement / Lake Management Plan*. The National Park Service interdisciplinary planning team reviewed the issues and developed the following impact topics for evaluation:

- air quality
- geology and soils
- water resources
- vegetation and shoreline vegetation
- wildlife and wildlife habitat
- threatened and endangered species
- cultural resources
- soundscapes
- visitor use and experience
- safety
- park operations
- socioeconomic resources

ALTERNATIVES SELECTED FOR ANALYSIS

The alternatives presented in this *Final Environmental Impact Statement / Lake Management Plan* were developed by the interdisciplinary planning team of Lake Mead National Recreation

Area after extensive public comment on issues and desired features. The team developed the criteria to characterize the recreational opportunity spectrum zoning and then mapped the zones on Lakes Mead and Mohave. The next step included developing the desired future conditions and alternatives to achieve those conditions. Once the alternatives were drafted, the team met with a wide variety of user groups to seek feedback on the alternatives. In 1998, five public meetings were held, and the alternatives were presented to the public. Following these public information meetings, the alternatives were modified to the four that were presented in the *Draft Environmental Impact Statement / Lake Management Plan*. Regarding personal watercraft use, the alternatives range from prohibiting personal watercraft under alternative A to unrestricted use of personal watercraft under alternative D.

In April 2002 the *Draft Environmental Impact Statement / Lake Management Plan* was released for public review in a formal 60-day comment period. Approximately 10,000 comment letters were received from public agencies, individuals, organizations, and businesses. The National Park Service interdisciplinary planning team evaluated the comments to determine if modification to the alternatives was warranted and if further analysis of issues and impacts was required. The introduction to "Volume 2: Comments and Responses," provides an explanation of the process the Park Service used to evaluate comments. In response to public input during the review period, alternative C (the preferred alternative) was modified slightly, and changes are identified under alternative C (the modified preferred alternative) in this *Final Environmental Impact Statement / Lake Management Plan*.

Also, new information that was provided during the comment period has been included in each alternative's impact discussions in the "Environmental Consequences" chapter of this *Final Environmental Impact Statement / Lake Management Plan*.

Each alternative identifies proposed actions related to recreational opportunity zoning and shoreline zoning, developed areas, facilities and recreational services, recreational conflict, sanitation and litter, resource protection, and park operations. Figure ES-1 illustrates the 24 zones established for use in this

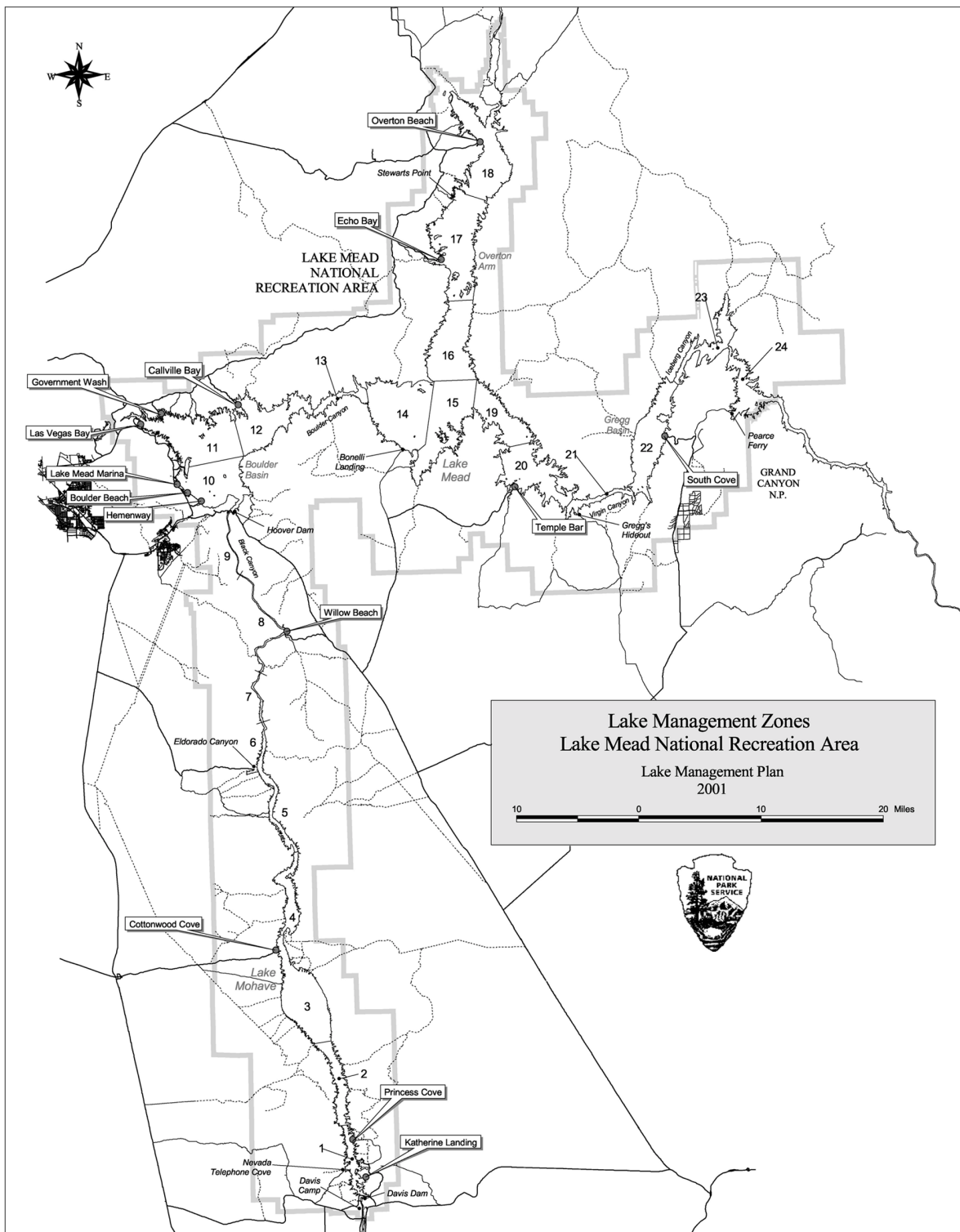


FIGURE ES-1: LAKE MANAGEMENT ZONES ESTABLISHED FOR MANAGING THE LAKE MEAD NATIONAL RECREATION AREA

Lake Management Plan. Table ES-1 presents a comparison of the actions proposed under the four alternatives.

A number of elements are consistent across all alternatives. These include

Application of recreational opportunity zoning — Under each alternative, the lake and shoreline areas are zoned according to a recreational opportunity spectrum (ROS) matrix that characterizes five recreational settings: primitive, semiprimitive, rural natural, urban natural, and urban park. A description of the settings is presented in table ES-2.

Development of a parking and circulation plan for each development area — Many of the development areas depend on gravel areas for circulation and parking. There is a need to evaluate each of the developed areas for circulation and parking. Parking design and layout would be dependent on the alternative selected.

Use of physical, environmental, and social carrying capacity measures — Each alternative utilizes zone carrying capacities based on studies conducted prior to the preparation of this plan.

The boating carrying capacities were established in the *General Management Plan* (NPS 1986) by setting development capacities for each marina including the number of slips, rental boats, and dry boat storage spaces. The determining factor for capacity was the physical space in the harbors as social crowding had not been identified as a planning constraint in the early 1980s. Data collected in 1993 and 1994 indicated that portions of the lakes were operating at or above social capacities during the summer holiday weekends at most launch sites and occasionally at Callville Bay and Katherine Landing on nonholiday summer weekends.

Moreover, visitor use surveys identified that visitors perceive crowded conditions occurring on the waters and at the shoreline during the peak use periods. A critical point was reached when 50% of the boaters reported the quality of their visit was diminished by the number of boats on the water.

As a result of these studies, boating capacities are proposed under each alternative that correspond with the recreational setting. A range of recreational settings is described and mapped for major areas of the lakes ranging from primitive to urban park (refer

to table ES-1). The elements described for each setting include accessibility, the extent of the facilities, the level of boating activity, the level of administrative controls on boating activities, and the integrity of the recreational setting. Visitor use models were used to project recreational settings and calculate the boating capacities. A summary of the boating capacities under each alternative is shown in table ES-3.

Boating capacities would be managed by limiting the amount of parking at each of the lake access sites including marinas and launch ramps. A set parking capacity would be established for each area based on the lake carrying capacities. These capacities would address all types of use within the developed areas including single and pull-through parking sites. The capacities for each developed area were set in the *General Management Plan*, but revised capacities are proposed under each alternative based on new information collected in the preparation of this plan. These facility capacities, including parking spaces, would set the basis for management of water recreation and would be monitored for effectiveness.

The method for determining the boating carrying capacities is included in appendix B. Tables ES-4 and ES-5 provide a comparison of the launch capacities and the calculated boating carrying capacities under each alternative for Lakes Mead and Mohave, respectively.

Summary of Alternative A (No Action)

The no-action alternative represents the management direction under the current *Lake Mead National Recreation Area General Management Plan* (NPS 1986). Under this alternative, park managers would manage increasing use without regard to providing a spectrum of recreational settings and a diversity of recreational activities. Improvements would be made only on an as-needed basis as funding becomes available. Required improvements for safety, facilities, conflict resolution, sanitation, litter, and resource preservation would be undertaken without a coordinated strategy and funding initiative.

TABLE ES-1: COMPARISON OF THE ALTERNATIVES

Program Elements	Alternative A (No Action)		Alternative B		Alternative C (Modified Preferred Alternative)		Alternative D (Baseline)	
Recreational Opportunity Zoning								
Percentage of Lake Mead by zone	Primitive	0%	Primitive	11%	Primitive	1%	Primitive	0%
	Semiprimitive	0%	Semiprimitive	0%	Semiprimitive	4%	Semiprimitive	0%
	Rural Natural	0%	Rural Natural	46%	Rural Natural	45%	Rural Natural	25%
	Urban Natural	39%	Urban Natural	18%	Urban Natural	15%	Urban Natural	24%
	Urban Park	61%	Urban Park	25%	Urban Park	35%	Urban Park	51%
Percentage of Lake Mohave by zone	Primitive	0%	Primitive	2%	Primitive	2%	Primitive	0%
	Semiprimitive	0%	Semiprimitive	4%	Semiprimitive	0%	Semiprimitive	0%
	Rural Natural	17%	Rural Natural	22%	Rural Natural	15%	Rural Natural	8%
	Urban Natural	59%	Urban Natural	62%	Urban Natural	51%	Urban Natural	59%
	Urban Park	24%	Urban Park	10%	Urban Park	32%	Urban Park	33%
Facilities								
Lake boating capacities	Lake access facilities and parking would be developed to support 5,975 boats at any one time (BAOT).		Lake access facilities and parking would be developed to support 4,393 boats at any one time.		Lake access facilities and parking would be developed to support 5,055 boats at any one time.		Lake access facilities and parking would be developed to support 5,800 boats at any one time.	
Facility expansion (boating education center)	None		A boating safety center would be constructed at Boulder Beach on Lake Mead. Another boating safety center could be constructed to serve Lake Mohave.		A boating safety center would be constructed at Boulder Beach on Lake Mead. Another boating safety center could be constructed to serve Lake Mohave.		A boating safety center would be constructed at Boulder Beach on Lake Mead. Another boating safety center could be constructed to serve Lake Mohave.	
Facility expansion (launch ramp and marina)	Under the <i>General Management Plan</i> , a new major marina has been proposed at Fire Mountain and the expansion of facilities has been authorized for Cottonwood Cove on Lake Mohave and for Callville Bay and Temple Bar on Lake Mead.		No expansion of facilities would be authorized over existing capacities.		Facility expansion would be authorized at Cottonwood Cove and Eldorado Canyon on Lake Mohave and at Callville Bay, Echo Bay, Overton Beach, Stewarts Point, and Temple Bar on Lake Mead.		Facility expansion would be authorized at Cottonwood Cove and Eldorado Canyon on Lake Mohave and at Callville Bay, Echo Bay, Overton Beach, Stewarts Point, and Temple Bar on Lake Mead.	

Program Elements	Alternative A (No Action)	Alternative B	Alternative C (Modified Preferred Alternative)	Alternative D (Baseline)
Visitor Conflict				
Shoreline zoning	Shoreline zoning is in place at Boulder Beach on Lake Mead where some areas and activities have mandatory zoning and others have voluntary zoning.	Shoreline zoning would be voluntary for camping, SCUBA, fishing, sailboarding, and personal watercraft use.	Shoreline zoning in the urban park zones would be mandatory for camping, SCUBA, fishing, and slalom course activities.	Shoreline zoning would be mandatory for camping, SCUBA, fishing, sailboarding, and personal watercraft use.
Shoreline conflict	Flat-wake regulations currently exist only in designated and/or marked areas under the <i>General Management Plan</i> .	A 100-foot flat-wake area is proposed around the entire shoreline of Lakes Mead and Mohave.	A 200-foot flat-wake area is proposed around beaches frequented by bathers, boats at the shoreline, and near people in the water and at the water's edge.	A 300-foot flat-wake area is proposed around the entire shoreline of Lakes Mead and Mohave.
Personal watercraft use	Personal watercraft use would be prohibited by absence of special regulation after November 2002.	EPA-compliant personal watercraft use would be authorized in the rural natural, urban natural, and urban park zones only.	Personal watercraft use would be authorized in the rural natural, urban natural, and urban park zones only. EPA standards would be adopted by 2012.	Personal watercraft use would be authorized in all zones of Lakes Mead and Mohave.
Alcohol use	Designated high-use areas are currently alcohol-free. Current regulations for alcohol consumption would apply.	Designated high-use areas and high-use shorelines would be alcohol-free and glass beverage containers and styrofoam would be prohibited. Current regulations for alcohol consumption would apply.	Designated high-use areas, high-use shorelines, and problem areas would be alcohol-free, if deemed to be in the best interest of the public. Alcohol consumption while operating a boat would be prohibited. Glass beverage containers and styrofoam would be prohibited within Lake Mead National Recreation Area.	Alcohol use, glass containers, and styrofoam would be prohibited within Lake Mead National Recreation Area.

Program Elements	Alternative A (No Action)	Alternative B	Alternative C (Modified Preferred Alternative)	Alternative D (Baseline)
Boater education	National Park Service would play only a limited role in boater education. Information systems are inadequate as to availability, coverage, targeted audience, and coordination.	National Park Service would offer boater education courses targeting Lake Mead National Recreation Area boaters to increase the number of educated boaters from 20% to 40%. Information systems would be aggressive and planned and use multilevel media.	National Park Service would support the state of Nevada implementation of a mandatory boater education program and encourage Arizona to implement such a program.	National Park Service would take the lead in boater education and would require boater education for all boat operators.
Enforcement	National Park Service would play only a limited role in proactive (preventative style patrols) and would do little to coordinate other agencies' patrols as to the times, areas, or emphasis of enforcement efforts. Boating laws now vary between states and between state and federal agencies.	National Park Service would have thorough coordination with other agencies, would ensure boat patrol coverage in high-use areas and would identify areas for patrol emphasis. National Park Service would rely on other agencies for patrol and would respond mostly to emergencies. National Park Service would encourage states to pass uniform boating regulations.	National Park Service would coordinate with other agencies to augment patrol efforts with the National Park Service, filling the gaps and ensuring lakewide coverage. The National Park Service would assist in the development of uniform boating laws and education program for Lakes Mead and Mohave.	National Park Service would take the lead in the patrol and enforcement function for Lakes Mead and Mohave. National Park Service, under the superintendent's authority, would make all boating regulations consistent lakewide.

Program Elements	Alternative A (No Action)	Alternative B	Alternative C (Modified Preferred Alternative)	Alternative D (Baseline)
Sanitation and Litter				
Sanitation	Under the <i>General Management Plan</i> , there are no sanitation guidelines for the public use of the backcountry shoreline. Restrooms are located in high-use sites (1 restroom per 80 boats). Boat pump-out facilities are located at the concession facilities. There is no opportunity for sanitary disposal of human wastes away from the marinas. There would be no change in sanitation management.	Restrooms would continue to be located along the shoreline in high-use areas and floating toilets would be located in high-boating areas at a density of 1 restroom per 40 boats. The public would be encouraged to use portable toilets. Public pump-out facilities would be expanded.	All overnight users on the lake would be required to have portable toilets to contain human waste. Additional boat pump-out facilities would be provided at public launch areas. Seven floating restroom / pump-out / toilet dump stations would be located on Lake Mead and three on Lake Mohave.	All boaters would be required to have portable toilets to contain human waste. Shoreline restrooms would be located at all high-use drive-in locations. Floating toilets would be placed in high-use areas at a density of 1 toilet per 150 boats. Portable toilets would be required for camping. Seven floating restroom / pump-out / toilet dump stations would be located on Lake Mead and three on Lake Mohave.
Litter	Shoreline litter is identified as one of the larger problems facing the management of the park. Litter bags are available at all marinas and launch ramps, and glass is prohibited in specific areas. National Park Service conducts and coordinates limited shoreline litter cleanup efforts. Litter management would continue as described in the <i>General Management Plan</i> .	Shoreline litter cleanup and recycling programs would be expanded. Glass and styrofoam would be prohibited in high-use areas. Litter bags would be available at launch ramps. Partnerships would be established to seek crews for shoreline cleanup.	Shoreline litter cleanup and recycling programs would be expanded. Glass beverage containers and styrofoam would be prohibited in the recreation area . Recycling bags and containers would be available at launch ramps and marinas. A National Park Service concession partnership would bring resources and attention to environmental issues.	National Park Service would take the lead in litter removal by scheduling litter patrols of heavy-use shoreline areas. All glass beverage and styrofoam would be prohibited in the recreation area . Litter and recycling bags would be available at the launch ramps and marinas. Partnerships would be established to seek voluntary crews to assist in shoreline cleanup.

Program Elements	Alternative A (No Action)	Alternative B	Alternative C (Modified Preferred Alternative)	Alternative D (Baseline)
Resource Protection				
Shoreline enhancements	Infrequent clearing of salt cedar takes place in selected shoreline areas. Some planting of native vegetation occurs along the shoreline. These shoreline enhancement practices would continue.	Selected shoreline areas would receive selective clearing of salt cedar and planting of native cottonwood or willow species.	Same as alternative B.	No shoreline enhancement would be likely due to increased visitation and use of lakeshore.
Inflow areas	Sensitive inflow areas are not provided with specific protection other than monitoring. Monitoring would continue, but no protection would be provided.	Sensitive inflow areas would be protected by the designation of nonmotorized use.	Sensitive inflow areas would be protected through the designation of primitive and semiprimitive zones, where motorized use would be prohibited or restricted.	Sensitive areas would not be provided additional protection and would receive additional motorized use.
Water quality	Bacterial water quality would continue to be monitored at marinas. No program currently exists to monitor chemical constituents in the waters, other than the annual testing required within the <i>Safe Drinking Water Act</i> . Personal watercraft would be banned. Continued use of all direct-injection two-stroke and four-stroke engines, and carbureted two-stroke engines would be allowed.	Bacterial water quality would be monitored at high-use areas, marinas, and backcountry beaches. National Park Service would begin a chemical water monitoring program that tracks hydrocarbons and other organic compounds associated with motorized use. Within a year of the record of decision for this environmental impact statement, engines that do not meet the EPA 2006 emission standards would be prohibited.	Same as alternative B. After 2012 all engines that do not meet the EPA 2006 emission standards would be prohibited.	Same as alternative B. Continued use of all direct-injection two-stroke and four-stroke engines, and carbureted two-stroke engines would be allowed.

Program Elements	Alternative A (No Action)	Alternative B	Alternative C (Modified Preferred Alternative)	Alternative D (Baseline)
Threatened, endangered, and sensitive species	Species would continue to be monitored. No conflict has been identified between the species and recreational use so no management actions have been taken.	Species would be monitored and if conflict occurs with recreation, use would be managed to remove the conflict. Certain areas might be closed to motorized uses to protect sensitive species, such as nesting birds.	Same as alternative B.	Same as alternative B.
Resource Protection				
Culturally sensitive areas	Cultural sites would continue to be monitored but not on a scheduled protocol. No impact on cultural sites from recreational use has been documented.	Cultural sites located in areas where they could receive impact from recreational use of the lakes would be monitored at a frequency that would ensure preservation. If damage was identified, sites would be evaluated and possibly closed to future recreational use.	Same as alternative B.	Same as alternative B.

TABLE ES-2: RECREATIONAL OPPORTUNITY SPECTRUM — LAKE MEAD NATIONAL RECREATION AREA

Primitive Setting	Semiprimitive Setting	Rural Natural Setting	Urban Natural Setting	Urban Park Setting
No roads, structures, facilities, or commercial services.	Unmaintained dirt or four-wheel-drive-vehicle road access. Dispersed camping area. Commercial services originating outside the zone.	Main access roads maintained, facilities primarily limited to National Park Service for lake access and use. Primitive campgrounds with designated sites. Commercial services originate outside the zone.	Paved access roads. Developed campground with section zoned for tent camping. Limited range of commercial facilities and services available. Limited range of commercial boating services available.	Paved roads. Fully developed campgrounds with hookups. Shoreline camping under permit. Full array of commercial facilities and services available.
Nonmotorized boat (except electric trolling motors) operating at less than 5 mph. Water activities that are supported by nonmotorized boats.	Boating and water activities restricted to flat-wake speeds or 65-horsepower engines. Personal watercraft prohibited. Electric trolling motors allowed.	Some types of boating and water activities are restricted. There are no special restrictions in this zone.	Time and location restrictions on waterskiing, wakeboarding, or tubing due to boat densities.	High level of boating and water activity, and highest levels of controls on boating. Time and location restrictions on waterskiing, wakeboarding, or tubing due to boat densities.
Restricted numbers, low visitation, rare human contact.	Occasional contact with visitors and other boaters.	Encounters with visitors and other boaters common.	Encounters with other visitors frequent, crowding and conflict are the exception.	Intense visitor use with congestion and high social contact. Conflicts expected.
Mechanical noise and lighting originate outside the zone.	No permanent lighting, no generators.	Lighting only for security and safety purposes. Noise expected during daylight hours, minimal noise at night.	Lighting provided for safety and security.	Artificial lighting, motorized vessels originating in the area, traffic noise expected into the night.
Natural-appearing landscape with pristine views.	Landscape appears natural except in access areas.	Natural landscape predominant with some manmade features.	Landscape modified with emphasis on natural features.	Highly modified landscape, buildings, graded beaches, and landscaping visible.
No expectation of NPS services, emergency services, law enforcement, interpretation, or maintenance; no scheduled patrols.	National Park Service responds to emergencies, infrequent patrols.	Patrols scheduled but occasional; response originates outside the zone with limited emergency services; law enforcement, maintenance, and interpretive services available.	Full range of emergency services; law enforcement, maintenance, and interpretive services available; patrols regular and frequent.	Full range of emergency services; law enforcement, maintenance, and interpretive services available; patrols regular and frequent.

TABLE ES-3: SUMMARY OF BOATING CAPACITIES FOR EACH ALTERNATIVE¹

	Alternative A (No Action)		Alternative B		Alternative C (Modified Preferred Alternative)		Alternative D (Baseline)	
Zone	Recreational Setting	BAOT	Recreational Setting	BAOT	Recreational Setting	BAOT	Recreational Setting	BAOT
Lake Mohave								
1	U	560	U	560	U	560	U	560
2	U	350	UN	260	U	350	UN	260
3	UN	325	RN	200	UN	325	U	500
4	UN	250	RN	125	UN	250	U	400
5	RN	100	RN	100	RN	100	RN	100
6	RN	48	SP	25	RN	48	UN	70
7	RN	17	SP	13	RN	17	RN	17
8	RN	95	RN	95	RN, SP, P	95	UN	125
9	RN	29	P	15	SP, RN, P	15	RN	29
Total		1,774		1,393		1,760		2,061
Lake Mead								
10	U	330	U	330	U	330	U	330
11	U	650	U	650	U	650	U	650
12	U	578	U	578	U	578	U	578
13	U	33	UN	25	UN	25	UN	25
14	UN	380	RN	75	RN	75	RN	75
15	UN	13	SP	11	RN, SP, P	11	RN	11
16	UN	130	RN	86	RN	86	UN	130
17	U	460	UN	360	U	460	U	460
18	U	603	RN	301	UN, RN, SP, P	452	U	603
19	UN	104	RN	60	RN	60	UN	104
20	U	501	UN	376	UN	376	U	501
21	U	50	RN	27	RN	27	UN	27
22	U	280	RN	100	RN	100	UN	180
23	UN	35	P	13	RN, SP	40	RN	40
24	UN	54	P	8	RN	25	RN	25
Total		4,201		3,000		3,295		3,739
Total Lake Mead National Recreation Area		5,975		4,393		5,055		5,800
<p>1. See appendix B for details.</p> <p>U = Urban UN = Urban natural</p> <p>RN = Rural natural SP = Semiprimitive</p> <p>P = Primitive BAOT = Boats at any one time</p>								

TABLE ES-4: SUMMARY OF LAUNCH CAPACITIES AT LAKE MEAD FOR EACH ALTERNATIVE

	Lake Mead Launch Capacity (Number of Boats per Day)			Carrying Capacity¹
	<u>Commercial²</u>	<u>Public³</u>	<u>Total⁴</u>	<u>BAOT⁵</u>
Alternative A	1,453	2,330	3,783	4,201
Alternative B	965	1,685	2,650	3,000
Alternative C	1,208	2,004	3,212	3,295
Alternative D	1,397	2,161	3,558	3,739

1. Carrying capacity reflects the recommended maximum number of boats on the water at any one time. Estimates are calculated using Graefe and Holland (1997) and are based on the proposed mix of recreational opportunity zones shown in table ES-1.

2. Assumes 20% of the boats in wet slips, 10% of the boats in dry storage, and 100% of the rental fleet are on the lake at any given time. Calculations are based on the number of authorized rental boats and slips under each alternative.

3. Estimated number of boats that could be launched in one day.

4. Total reflects the estimated maximum number of boats that could be on the lake at any one time based on the launch capacity.

5. Boats at any one time.

TABLE ES-5: SUMMARY OF LAUNCH CAPACITIES AT LAKE MOHAVE FOR EACH ALTERNATIVE

	Lake Mohave Launch Capacity (Number of Boats per Day)			Carrying Capacity¹
	<u>Commercial²</u>	<u>Public³</u>	<u>Total⁴</u>	<u>BAOT⁵</u>
Alternative A	642	967	1,609	1,774
Alternative B	475	947	1,422	1,393
Alternative C	524	1,147	1,671	1,760
Alternative D	574	1,494	2,068	2,061

1. Carrying capacity reflects the recommended maximum number of boats on the water at any one time. Estimates are calculated using Graefe and Holland (1997) and are based on the proposed mix of recreational opportunity zones shown in table ES-1.

2. Assumes 20% of the boats in wet slips, 10% of the boats in dry storage, and 100% of the rental fleet are on the lake at any given time. Calculations are based on the number of authorized rental boats and slips under each alternative.

3. Estimated number of boats that could be launched in one day.

4. Total reflects the estimated maximum number of boats that could be on the lake at any one time based on the launch capacity.

5. Boats at any one time.

Summary of Alternative B

This alternative would provide for the most primitive recreational opportunities for visitors while protecting sensitive natural and cultural resources. Compared with other alternatives, greater limitations would be placed on motorized water recreation. All carbureted two-stroke engines, including carbureted two-stroke personal watercraft, would be banned from the recreation area within one year of finalizing this plan. The development of new facilities would be limited compared to the other alternatives, and some uses would be reduced or eliminated from some areas. The restoration of natural shoreline areas that have been degraded through overuse is emphasized.

Summary of Alternative C (Modified Preferred Alternative)

This alternative addresses the NPS mission as well as the management objectives and long-term vision for Lakes Mead and Mohave. The need to protect the natural environment and support the recreational interests of park visitors is recognized under this alternative. Under this alternative, 5% of the waters would be managed for semiprimitive or primitive, yet provide for an increase in boating activities. In this alternative all two-stroke carbureted engines would be prohibited after 2012. Specific actions to address personal watercraft use, shoreline and boating conflicts, and litter and sanitation issues are included under this alternative.

Summary of Alternative D (Baseline)

This alternative emphasizes growth with a corresponding reduction in the variety of recreational opportunities on the lakes. The waters of the recreation area would be managed for concentrated use with a greater percentage designated as urban park under the recreational opportunity spectrum, and no areas would be designated as primitive or semiprimitive. With the increase in urban park zoning, there could be an increase in marina and boat launching facilities. There would be limited opportunities for shoreline restoration under this alternative.

ENVIRONMENTAL CONSEQUENCES

Table ES-6, located at the end of this section, provides a comparison of the long-term impacts under each alternative.

Impacts of Alternative A: No Action

Alternative A, the no-action alternative, is based on implementing the *General Management Plan* that was approved in 1986. Specific actions authorized under the *General Management Plan* include expanding the marinas at Cottonwood Cove, Callville Bay, and Temple Bar, and formalizing shoreline camping at Government Wash. The development of a new facility at the Fire Mountain Site on the Nevada side of Lake Mohave, while authorized in the *General Management Plan*, has been removed from this alternative because the remote location and costs associated with development at this site make it infeasible and because of issues related to carrying capacity and preserving the desert tortoise and its habitat.

The impacts of the actions and management prescriptions under the *General Management Plan* are addressed in that plan; the impacts are summarized below.

In addition, under this no-action alternative, no rule would be developed to allow for the continued use of personal watercraft in the recreation area. Impacts resulting from the complete elimination of personal watercraft from the recreation area are addressed in this discussion.

Impacts on Air Quality. Under alternative A, hydrocarbon (HC) emissions would be 369 tons in 2004 and 320 tons in 2012, compared with alternative D (918 in 2004 and 659 tons in 2012). Under alternative A, elimination of personal watercraft along with replacement of other marine engines would result in HC emission reductions of 549 tons per year in 2004 and 339 tons per year in 2012 compared to alternative D (baseline).

Under alternative A, there would be a net reduction in HC+NO_x emissions of 480 tons per year in 2004 and 279 tons per year in 2012 when compared to alternative D (baseline) and a potential beneficial effect on regional ozone levels. The impact on human health from HC and NO_x would be minor in the long-term. Compared to alternative D, by the year 2012, the ban would eliminate personal watercraft

emissions of over 1,947 tons of carbon monoxide and 467 tons of hydrocarbons. Other pollutants would be eliminated as well.

Impacts to air quality-related values would be moderate. PM_{2.5} reductions would contribute to an improvement in visibility, and the reduced ozone production would contribute to a reduced potential for plant damage. The impact is classified as moderate because of the existing SUM06 ozone index.

The pollutant concentrations in the Lake Mead National Recreation Area would continue to be within national ambient air quality standards. No changes are expected in the class II airshed status, because motorized boating activity will not result in a violation of any national air quality standard. Construction impacts from fugitive dust would be short-term and minor, as particulate emission impacts would be minimized by the use of dust-control measures.

Implementation of this alternative would not result in an impairment of the air quality resource.

Impacts on Geologic Resources. Some impacts on previously disturbed soils would occur at the expansion sites around Temple Bar, Callville Bay, and Cottonwood Cove. Soils not previously disturbed at the expansion sites could be altered by compaction, which could lead to increased erosion and soil loss. Mitigation based on site design and construction standards would reduce this impact. Overall, the impacts resulting from the expansion of developed areas within the recreation area or the construction of new facilities could, when combined, create moderate impacts. Development sites would be small in nature relative to the total protected acreage of the recreation area and would not result in the loss of the integrity of the geologic and soil resources.

Implementation of this alternative would not result in an impairment to geologic resources.

Impacts on Water Resources. Even with the elimination of personal watercraft, moderate impacts on water quality could occur during the summer in high-use areas or in coves where water flow is limited and where there is a lack of sanitation requirements. Antidegradation requirements could be surpassed during high-use periods, and certain areas could be temporarily or permanently closed to recreational use.

The threshold requirements to meet standards for alternative A are less than those required under baseline (alternative D) conditions for all compounds evaluated because, under alternative A, no personal watercraft are allowed. The threshold volumes at Lake Mead required to meet water quality standards in alternative A are 29% less than threshold volumes required for alternative D in the year 2004, and 19% less than alternative D in the year 2012.

Threshold volumes at Lake Mohave required to meet water quality standards are 47% less than alternative D in 2004 and 43% less than alternative D in 2012. Based on the impact threshold definitions, the effect from the use of all watercraft allowed under alternative A would cause negligible to minor adverse effects on the water quality of Lakes Mead and Mohave.

Reduced water quality could harm aquatic organisms through algae blooms, suspended solids and turbidity, and oxygen depletion. However, the lakes hold an immense amount of water, with a large volume of water flowing through the system.

Implementation of this alternative would not result in an impairment of the water quality resource.

Impacts on Vegetation Including Shoreline Vegetation. Impacts on vegetation from construction would be minor and localized within the construction site in development zones. With revegetation and landscaping of native species, some recovery of the area would be likely. If recreational use of rare plant habitat increases, some rare plant species habitat and individual plants could be damaged. However, Lake Mead National Recreation Area would continue to preserve large portions of rare plant habitat in the area. Water quality should improve moderately during the summer months in high-use coves due to the elimination of personal watercraft. There would be no impairment to vegetation or vegetative communities from implementing the components of this alternative.

Impacts on Wildlife and Wildlife Habitat. Wildlife would be temporarily displaced from the expansion areas due to construction activities. Wildlife species at construction sites that could not move from the area could be destroyed by construction activities. However, considering the small size of the affected area and the availability of habitat nearby, this impact would be considered minor. This alternative would not provide any additional protection for wildlife species within the recreation area; however, impacts

associated with personal watercraft use would be eliminated. Sensitive species around inflow areas could continue to be disturbed by motorized vessels. There could be moderate to major impacts on nesting bird habitat from the continued unregulated use of motorized vessels within sensitive roosting and nesting areas in the recreation area.

Implementation of this alternative would not [result in impairment](#) to wildlife [and wildlife habitat](#).

Impacts on Threatened and Endangered Species.

Under the evaluation of section 7 of the *Endangered Species Act*, the determination has been reached that this no-action alternative would have no effect on the California brown pelican; would not likely adversely affect the bald eagle, peregrine falcon, Yuma clapper rail, and Western snowy plover; and would likely adversely affect the desert tortoise, [Southwestern willow flycatcher](#), razorback sucker, and bonytail chub. The ban of personal watercraft would have slight beneficial effects on sensitive habitat in the inflow portions of Lake Mead by removing the noise and disturbance from these vessels and eliminating the emissions from carbureted two-stroke engines.

Mitigation measures related to construction activities should serve to reduce or eliminate any potential impacts on these species. Monitoring would continue to determine if recreational use is impacting endemic fish species or the willow flycatcher.

There would be no impairment to threatened, endangered, or species of concern from the impacts resulting under this alternative.

Impacts on Cultural Resources. Site design and coordination with the cultural resources manager would ensure that no cultural resources are damaged under this alternative. Rehabilitation efforts would continue in cultural landscape areas that have been damaged by visitor use.

[All areas of future development will be inventoried for cultural resources as required by 36 CFR part 800, and all cultural resources will be evaluated for eligibility to the National Register of Historic Places. If the project results in any adverse effects to cultural resources, the National Park Service will consult with the appropriate State Historic Preservation Office in the development of a mitigation plan.](#)

[There would be no impairment to cultural resources from implementation of this alternative.](#)

Impacts on Visitor Use, Experience, and Safety.

This alternative would not provide an improved recreational experience for visitors. Visitor experience would likely deteriorate with the implementation of this alternative. There would continue to be visitor conflicts among different user groups. Unsanitary conditions would continue to be a problem at high-use camping areas and beaches. While the restriction on the use of personal watercraft would reduce impacts from these vessels, including visitor conflict and accidents related to their use, the high densities of boats would continue to create safety problems and could potentially cause more accidents on the lakes, creating moderate to major adverse impacts.

Conflicts arising from irresponsible and unsafe personal watercraft use would be eliminated from the recreation area with the ban of these vessels. While some visitors would feel this is a beneficial impact on their experience, other visitors who are used to operating their personal watercraft on Lakes Mead and Mohave would experience major impacts from the ban. This user group, including the majority of the 11,000 registered personal watercraft owners in Clark County, Nevada, would be displaced from the recreation area. Personal watercraft users would be forced to travel long distances to find areas that allow personal watercraft.

Visitors would not have the full spectrum of opportunities to enjoy a variety of recreational settings within the recreation area. This would cause certain visitors to be dissatisfied with their recreational experience.

Impacts on Soundscapes. There would be no areas set aside to preserve the natural quiet on Lakes Mead or Mohave. [Stricter regulations and the enforcement of the Nevada boating noise standards would reduce the noise from vessels operating over 75 A-weighted decibels when measured at the shoreline, independent of speed or distance.](#) As carbureted two-stroke engines are replaced by newer, quieter models, noise levels would be reduced on the lakes. Noise from personal watercraft would be eliminated from the lakes, [but could gradually be replaced by additional boats.](#) Overall noise from motorized vessels would be considered [a minor to moderate impact in the areas of higher use, and a moderate to major impact in the areas of lower use.](#) Construction activities would temporarily impact localized areas [and would create minor impacts.](#) Considering the enabling legislation, the history of motorized vessel use at Lake Mead National Recreation Area, and the park's goals and

objectives to protect park resources and values, some noise from this source of recreational use is appropriate.

Impacts under alternative A would not result in impairment to the park's soundscape.

Impacts on Socioeconomic Resources.

Socioeconomic resources within and outside the recreation area would benefit from increased visitation and expanded facilities at Callville Bay, Temple Bar, and Cottonwood Cove. However, this would be negated by the ban on personal watercraft, which could create a major negative impact on concession-operated facilities and businesses in the area that sell or rent personal watercraft.

Impacts on Park Operations. Staffing requirements are not being met to adequately provide visitor services and protection, facility upkeep and maintenance, interpretive and educational services, and resource protection and management. According to the 1999 *Lake Mead National Recreation Area Business Plan* (NPS 1999a), recreation area management staff, and personnel audits conducted at Lake Mead National Recreation Area, the Lake Mead staff is deficient in over 105 positions necessary to provide adequate visitor services and education, facility upkeep, and resource management.

Impacts on Sustainability and Long-Term Management. Actions proposed under this alternative along the lakeshore area would not result in any significant loss of long-term productivity because the land areas impacted are small in size and low in productivity compared with the remaining unaffected areas within the recreation area. New site development and expansion of existing sites would cause irretrievable commitments of soil and vegetative resources. This would be reduced with the adoption of effective mitigation measures. However, all adverse impacts on the soil and vegetative resources could not be avoided under this alternative and would lead to the loss of habitat for wildlife species in the development and expansion areas.

The continued unrestricted use of carbureted two-stroke engines, along with the continuing problems with sanitation along the lakeshore, could adversely impact the water quality of the lakes, and recreational water quality standards could be exceeded during certain periods at certain locations. It would be unlikely that this impact on water quality would be an irreversible or irretrievable commitment of resources, because of the size of the lakes. However, it could

cause immediate impacts by forcing area closures, and there is the potential that reduced water quality could harm aquatic organisms with algae blooms, suspended solids and turbidity, and oxygen depletion.

Impacts of Alternative B

Under this alternative, facility development would be capped at the existing level. Existing shoreline areas would continue to be used for lake access and parking. Suitable parking areas would be paved under this alternative. This alternative would emphasize primitive recreational opportunities for visitors while protecting sensitive natural and cultural resources and restoring lakeshore areas previously degraded through overuse.

The major action under this alternative is zoning the lakes to include primitive and semiprimitive recreational settings or zones. Approximately 10% of the waters of Lakes Mead and Mohave would be zoned primitive or semiprimitive and would experience reduced boating levels and, in the case of the primitive setting, the elimination of motorized boating.

On Lake Mead, primitive areas would be established at critical inflow areas including the tributaries of the Muddy and Virgin Rivers. These areas would be relatively small and would not affect recreational boating. The primary purpose of these small primitive areas is to protect the sensitive mixing area of the rivers and the lake. Additional primitive areas would be established from Pearce Ferry to Iceberg Canyon, including the Grand Wash Bay and Gypsum Bay areas of Lake Mead. As these bays are located away from the main channel of the lake, the prohibition of motors would primarily affect recreational and tournament fishing and boaters out of the South Cove and Meadview. The West Gypsum Bay area was closed to all boating for use as a research area up until 1998.

On Lake Mohave, Black Canyon would be managed as a primitive recreational setting, which would prohibit the use of motors in the canyon, with the exception of administrative patrols and concession-operated raft trips.

Another major component of this alternative is the ban of all carbureted two-stroke engines, including personal watercraft, from the recreation area within a year of finalizing this plan.

Impacts on Air Quality. Implementation of alternative B would eliminate carbureted two-stroke engines from the park within one year of the approval of the plan. Other engine types would replace the carbureted two-stroke engines.

Under alternative B, hydrocarbon (HC) emissions would be 346 tons in 2004 and 2012, compared with alternative D (918 in 2004 and 659 tons in 2012). The reductions under alternative B would occur because all carbureted two-stroke engines would be eliminated after 2004. Under alternative B, elimination of these engines would result in HC emission reductions of 572 tons per year in 2004 and 313 tons per year in 2012 compared with alternative D.

Under alternative B, there would be a net reduction in HC+NO_x emissions of 552 tons per year in 2004 and 306 tons per year in 2012 when compared to alternative D, and a potential beneficial effect on regional ozone levels. The impact on human health from HC and NO_x would be minor in the long-term.

Under alternative B, elimination of carbureted two-stroke engines would result in CO emission reductions of 166 tons per year in 2004 and 215 tons per year in 2012, compared with alternative D. The impact to human health from CO emissions would be minor.

Although other engine types would replace the carbureted two-stroke engines, the replacement engines would be more efficient, and there would be sizeable reductions in HC+NO_x emissions. There would also be reductions in particulate (PM₁₀ and PM_{2.5}) and CO emissions. Compared to alternative D, by the year 2012, the conversion to cleaner engines required under alternative B would eliminate personal watercraft emissions of over 278 tons of hydrocarbons and 268 tons of HC+NO_x. Other pollutants would be eliminated as well.

Impacts to air quality-related values would be moderate. PM_{2.5} reductions would contribute to an improvement in visibility, and the reduced ozone production would contribute to a reduced potential for plant damage. The impact is classified as moderate because of the existing SUM06 ozone index.

The pollutant concentrations in the Lake Mead National Recreation Area would continue to be within national ambient air quality standards. No changes are expected in the class II airshed status,

because motorized boating activity will not result in a violation of any national air quality standard.

There are no construction impacts since this alternative does not allow for expansion.

Implementation of this alternative would not result in an impairment of the air quality resource.

Impacts on Geologic Resources and Soils. No impacts on geologic resources or soils would occur as a result of this alternative.

Implementation of this alternative would not result in impairment to geologic resources.

Impacts on Water Resources. With the implementation of zoning, sanitation regulations, and the conversion to efficient engines, the water quality of Lakes Mead and Mohave would improve, especially in high-use areas and inflow areas. The beneficial effects on water quality under this alternative could result in detectable improvements to the water quality in high-use coves during busy periods in the summer.

Adverse impacts from personal watercraft under alternative B would be negligible to minor, because only personal watercraft using clean technology four-stroke or direct-injection engines would be allowed on Lakes Mead and Mohave.

Alternative B establishes the lowest boating capacity of all the alternatives, and would eliminate all carbureted two-stroke engines from the park by 2004. Although other engine types would replace the carbureted two-stroke engines, the replacement engines would be cleaner, resulting in less pollutant load to the lakes.

Under alternative B the threshold volume of water required to meet water quality standards in both years (2004 and 2012) would be approximately 78,000 acre-feet, or less than 4% of the available mixing volume at Lake Mead; and approximately 40,000 acre-feet, or less than 6% at Lake Mohave. This would result in negligible to minor adverse effects on the water quality of Lakes Mead and Mohave. The threshold volumes required to meet water quality standards in alternative B are 65% less than threshold volumes required for alternative D at Lake Mead and 79% less than alternative D at Lake Mohave in 2004.

Under alternative B threshold volumes required to meet water quality standards are 53% less than

alternative D at Lake Mead and 69% less than alternative D at Lake Mohave in the year 2012. There would be short- and long-term benefits from implementing alternative B.

Implementation of this alternative would not result in an impairment of the water quality resource.

Impacts on Vegetation Including Shoreline Vegetation. Negligible to minor impacts on native vegetation could occur under this alternative with continued recreational use around the lakes. Nonnative species would be removed at selected high-use beaches to improve the recreational setting. If the recreational use of rare plant habitat increases, some rare plant species habitat could be lost, and individual plants could be damaged. However, Lake Mead National Recreation Area would continue to preserve large portions of rare plant habitat in the area.

There would be no impairment to vegetation or vegetative communities within the recreation area from the impacts resulting from this alternative.

Impacts on Wildlife and Wildlife Habitat. There would be no adverse impacts on wildlife under this alternative. Wildlife habitat in the sensitive inflow areas and in Black Canyon would be further protected from noise and disturbance from boats and personal watercraft with the primitive and semiprimitive zoning and watercraft restrictions in these areas. There would be beneficial impacts on wildlife from the restrictions placed on motorized use, the establishment of shoreline flat-wake zones, and the limitations placed on personal watercraft use.

There would be no impairment to wildlife resources from the impacts resulting from this alternative.

Impacts on Threatened and Endangered Species. This alternative would not likely adversely affect any threatened and endangered species and could benefit certain species. Populations of willow flycatcher might benefit from the establishment of nonmotorized zones around inflow areas and the flat-wake zone around the shoreline. Razorback suckers and bonytail chub might benefit from the temporal zoning of spawning areas. The water quality and health of the aquatic ecosystem would improve over the long-term with the ban on carbureted two-stroke marine engines. While continued recreational use during the spawning periods of bonytail chub and razorback suckers could temporarily disrupt spawning activities, this impact would not likely

jeopardize the continued survival of these species. The flat-wake zone should further protect these species.

Under the evaluation of section 7 of the *Endangered Species Act*, the determination has been made that this alternative would have no effect on the California brown pelican and would not likely adversely affect the bald eagle, peregrine falcon, desert tortoise, Yuma clapper rail, Western snowy plover, or willow flycatcher. Since the overall effect of this alternative would be beneficial by improving aquatic habitat, but would also likely cause some adverse effects from continued recreational activities creating temporary disturbances during spawning activities, it has been determined that this action would likely adversely affect razorback suckers and bonytail chubs.

There would be no impairment to threatened or endangered species or species of concern from the impacts resulting from this alternative.

Impacts on Cultural Resources. No adverse impacts on cultural resources would occur. Further protection of cultural resources could be afforded to sites if zoning were applied to limit recreational activities.

There would be no impairment to cultural resources from the impacts resulting from this alternative.

Impacts on Visitor Use, Experience, and Safety. Visitors who rely on motorized recreation, including personal watercraft users, could experience moderate impacts due to the displacement from their desired recreational location. This alternative would create major impacts on those persons who do not have EPA-compliant engines. They would have to purchase direct-injection two-stroke or four-stroke engines or be displaced from the recreation area.

Nonmotorized users could have an improved experience in areas where motors are prohibited due to less noise, less wake from vessels, and from hazards associated with motorized use. Nonmotorized users of Black Canyon would be required to be more self-reliant since motorized users, other than the administrative patrols and concession-operated raft tours, would not be available to assist visitors.

Voluntary zoning could lead to visitor conflict if the recommended activities are not adhered to. Continued use of alcohol within the recreation area

could lead to visitor conflicts. Boating safety should improve with the implementation of the education program and the shoreline flat-wake area. Requirements for portable toilets and restrictions on glass and styrofoam would improve sanitation around the lakeshore, and the quality of the recreational experience for visitors could improve.

Impacts on Soundscapes. The inflow areas of the Virgin and Muddy Rivers, Pearce Ferry, and the Gypsum Bed areas would be designated for nonmotorized uses only. This would serve to protect the soundscape and natural quiet in these areas, which would be a beneficial impact on nonmotorized recreationists and the natural resources in those areas, including wildlife. The northern portion of Black Canyon above Willow Beach would be zoned to prohibit motorized uses year-round. This would allow for the natural sounds to be the primary sounds during those periods. The continued operation of the commercial raft tours during these periods would create a minor impact, as the noise from these rafts would only be heard occasionally and the primary sound would be the natural sounds.

Considering the enabling legislation, the history of motorized vessel use at Lake Mead National Recreation Area, and the park's goals and objectives to protect park resources and values, some noise from this source of recreational use is appropriate. The continued use of motorized vessels would continue to have a moderate impact on the soundscape. Stricter regulations and the enforcement of the Nevada boating noise standards would reduce the noise from vessels operating over 75 A-weighted decibels when measured at the shoreline, independent of speed or distance. The elimination of carbureted two-stroke engines would reduce the noise from these vessels.

The 100-foot flat-wake zone could also reduce the impacts of noise on people and wildlife on the shoreline. Overall, this alternative would better protect the natural soundscape in the remote, isolated, and designated primitive areas of the recreation area by restricting the use of motorized vessels in these areas.

No impairment to park resources would occur as a result of the impacts from this alternative.

Impacts on Socioeconomic Resources. Under this alternative, all concession-operated facilities within the park, except the Willow Beach concession operation, could benefit slightly from the predicted annual growth in visitation. However, no expansion

would be allowed at any concession-operated facility under this alternative, creating a negative impact on the concessioners who had expectations of growth. Initially, concession operations would be negatively impacted from the restriction on glass and styrofoam and by the ban on carbureted two-stroke engines, though these would be temporary impacts. The economy of adjacent communities and the region could benefit from the expected annual growth in visitation to the recreation area. However, businesses that rent or sell older model carbureted two-stroke engines and personal watercraft would be negatively impacted by the restriction of their use in the recreation area. Businesses that sell or rent direct-injection two-stroke and four-stroke engines at the recreation area would benefit from the requirements under this alternative.

Impacts on Park Operations. According to the 1999 *Lake Mead National Recreation Area Business Plan* (NPS 1999a), recreation area management staff, and personnel audits conducted at Lake Mead National Recreation Area, a total of 147 additional park staff would be required to effectively implement this alternative.

Impacts on Sustainability and Long-Term Management. Actions proposed under alternative B would not result in any loss of long-term productivity, create irreversible or irretrievable commitments of resources, or result in any adverse impacts on park resources.

The Impacts of Alternative C: Modified Preferred Alternative

Alternative C would provide for a range of recreational opportunities from primitive to urban park on both lakes. Facility expansion, including the construction of new or the improvement of existing launch ramps, the addition of slips in specific marinas, or the addition of boats in the rental fleet, could take place at several marinas. Marinas that could expand under this alternative include Cottonwood Cove on Lake Mohave, and on Lake Mead, Overton Beach, Temple Bar, Echo Bay, and Callville Bay. In addition, new lake access is proposed under this alternative at Eldorado Canyon on Lake Mohave, and new facilities are proposed at Stewarts Point on Lake Mead. This alternative would also include the construction of a loop road from Government Wash to Boxcar Cove and the paving of selected access roads and parking lots.

A major action under this alternative would be zoning the lakes to include primitive and semiprimitive recreational settings or zones. Approximately 5% of the waters of the lakes would be zoned primitive or semiprimitive, which would result in reduced boating levels and, in the case of the primitive settings, the elimination of motorized boating, except electric trolling motors.

On Lake Mead, primitive zones would be established at the critical inflow areas of the Virgin River and in the Gypsum Beds area. Semiprimitive zones with flat-wake restrictions would be established at the Muddy River inflow area (Overton Wildlife Management Area), Grand Wash Bay, and Bonelli Bay. The area above Paiute Point extending to the mouth of the Grand Canyon National Park would be managed as rural natural or semiprimitive, depending on whether Grand Canyon National Park would allow motorized boat traffic to enter the canyon from Lake Mead National Recreation Area.

On Lake Mohave, the primitive and semiprimitive area would include Black Canyon above Willow Beach. In this area, temporal zoning would be applied, providing a range of recreational settings. The area would be managed for a primitive setting two days per week on a year-round basis. Between Labor Day and Memorial Day, the area would be managed for a semiprimitive setting five days per week. During the summer months between Memorial Day and Labor Day, the area would be managed for a rural natural setting with only houseboats, waterskiing, and wakeboarding prohibited. Personal watercraft use would be monitored during this period and restricted if the safety of lake users becomes an issue. This would be determined by reported conflict information and boating incidents.

This alternative would allow for the continued use of two-stroke engines and personal watercraft through 2012, or 10 years after approval of the plan, except in areas specifically zoned to prohibit all motorized vessels, as described above, and other regulated areas marked by buoys or signs.

Impacts on Air Quality. Implementation of alternative C would eliminate carbureted two-stroke engines from the park by 2012. Prior to that time, there would be no notable change in air quality, compared with alternative D (the baseline). In 2012, more efficient engine types would replace the carbureted two-stroke engines.

Under alternative C, hydrocarbon emissions would be 904 tons in 2004 and 360 tons in 2012, compared with alternative D (918 in 2004 and 659 tons in 2012). The reductions under alternative C would occur because carbureted two-stroke engines would be replaced with cleaner engines after 2012. This reduction would also result from a smaller park boating capacity compared to alternative D and from restrictions on personal watercraft or engine types. Under alternative C, the conversion to cleaner engines would result in HC emission reductions of 299 tons per year in 2012 compared to alternative D.

Under alternative C, there would be a net reduction in HC+NO_x emissions of 287 tons per year in 2012 when compared to alternative D, and a potential beneficial effect on regional ozone levels. The impact on human health from HC and NO_x would be minor in the long-term.

Under alternative C, conversion of carbureted two-stroke engines would result in CO emission reductions of 83 tons per year in 2004 and 30 tons per year in 2012, compared with alternative D. The impact to human health from CO emissions would be minor.

Compared to alternative D, by the year 2012, the conversion to cleaner engines required under alternative C would eliminate personal watercraft emissions of 268 tons of HC and 256 tons of HC+NO_x. Other pollutants would be eliminated as well.

Impacts to air quality-related values would be moderate. PM_{2.5} reductions would contribute to an improvement in visibility, and the reduced ozone production would contribute to a reduced potential for plant damage. The impact is classified as moderate because of the existing SUM06 ozone index.

Construction impacts from fugitive dust would be short-term and minor, as particulate emission impacts would be minimized by the use of dust-control measures. Potential lead or asbestos hazards from facility renovation would be avoided by the use of licensed contractors for testing and removal of materials, if necessary, in accordance with federal and state regulations.

Under alternative C, the pollutant concentrations in the Lake Mead National Recreation Area would continue to be within national ambient air quality standards. No changes are expected in the class II

airshed status, because motorized boating activity will not result in a violation of any national air quality standard.

Implementation of this alternative would not result in an impairment of the air quality resource.

Impacts on Geologic Resources and Soils.

Development that occurs in previously undisturbed sites could impact soil resources. Impacts that could result include soil compaction, which could lead to erosion and runoff. Revegetation and site design would help minimize these impacts. Overall, the combined impacts from the expansion of developed areas within the recreation area and the construction of new facilities or roads would create moderate impacts.

Due to the size of the recreation area and the large amount of protected geologic resources and desert soils, no impairment to soils or geologic resources would occur from the impacts resulting from this alternative.

Impacts on Water Resources. Some minor, temporary, localized impacts on water quality could occur around construction sites. Under this alternative, water quality in high-use areas should improve in the long-term as portable toilet requirements are implemented, sanitation is improved, and carbureted two-stroke engine use is eliminated after 2012. Areas would continue to be monitored to ensure recreational standards for water quality are met.

The total boating capacity for both lakes under alternative C is 5,055 boats at any one time, compared to 5,800 boats at any one time under alternative D in 2004.

In 2004 at Lake Mead for all engine types, a maximum threshold volume of approximately 199,000 acre-feet, or 10% of the available mixing volume, would be required to meet water quality standards. This would be considered a negligible to minor adverse impact. The threshold volumes required to comply with water quality standards at Lake Mead under alternative C are 12% less than threshold volumes required for alternative D in the year 2004.

In 2012 at Lake Mead, when carbureted two-stroke engines would be eliminated, a maximum threshold volume of 86,000 acre-feet, or approximately 4% of the available mixing volume, would be required to

meet the water quality standards. This would be considered a negligible to minor adverse impact. The threshold volumes required to meet water quality standards at Lake Mead under alternative C are 48% less than alternative D in 2012.

The maximum threshold volume of water required to meet water quality standards at Lake Mohave in 2004 for all engine types would be 165,000 acre-feet, or approximately 24% of the available mixing volume. This would be considered a negligible to minor adverse impact. The threshold volumes required to meet water quality standards at Lake Mohave in 2004 under alternative C are 15% less than threshold volumes required for alternative D.

In 2012 at Lake Mohave, a maximum threshold volume of 51,000 acre-feet, or approximately 7% of the available mixing volume, would be required to meet the water quality standards. This would be considered a negligible to minor adverse impact. The threshold volumes required to meet water quality standards at Lake Mohave under alternative C are 61% less than alternative D in 2012. Effects would be long-term because they would recur annually during the summer heavy-use season.

Implementation of this alternative would not result in an impairment of the water quality resource.

Impacts on Vegetation Including Shoreline Vegetation.

Some damage to vegetation would occur on a localized basis. Topsoil would be removed prior to construction and replaced afterwards, where feasible, to save the seed base and assist with restoration. Revegetation and landscaping with native vegetation would occur to replace vegetation. Under this alternative, no significant, long-term cumulative effects on the vegetative community would be expected. Nonnative salt cedar would be removed from selected shoreline areas and replaced with native cottonwood and willow trees, which could lead to some beneficial effects on the shoreline communities. Sensitive plant habitat would be monitored and additional levels of protection from recreational activities would be implemented if deemed necessary by park resource managers. There would be no impairment to native vegetation from the impacts resulting under this alternative.

Impacts on Wildlife and Wildlife Habitat. Wildlife could be disturbed at the construction sites during the construction periods, and marginal wildlife habitat would be removed. Based on the mitigation measures and the amount of undisturbed habitat adjacent to or

nearby the development area, this impact would be minor. Construction projects along the lakeshore could temporarily impact aquatic habitat by increasing turbidity. This impact would be short-term and localized during construction activities and would be considered minor. This alternative would provide further protection to the sensitive inflow areas of Lake Mead from the potential disturbances resulting from motorized uses. This would result in some beneficial impacts. Implementation of this alternative would further the protection of wildlife habitat by reducing conflicts in critical nesting areas. The impacts of implementing this alternative would not impair park resources relative to wildlife.

Impacts on Threatened and Endangered Species.

The National Park Service would take all possible precautions to ensure that actions under this modified preferred alternative would not result in a jeopardy finding to threatened and endangered species. More protection to Southwestern willow flycatcher populations in the sensitive inflow areas of Lake Mead would occur as a result of zoning for nonmotorized uses and temporal closures in these areas. Water quality and health of the aquatic ecosystem could improve over the long-term as carbureted two-stroke engines are phased out. While continued recreational use during the spawning periods of bonytail chub and razorback suckers could temporarily disrupt spawning activities, this impact would not likely jeopardize the continued survival of these species.

Under the evaluation of section 7 of the *Endangered Species Act*, the determination has been made that this alternative would have no effect on the California brown pelican and would not likely adversely affect the desert tortoise, bald eagle, peregrine falcon, Yuma clapper rail, Western snowy plover, and willow flycatcher, since the overall effect of this alternative would be beneficial by improving aquatic habitat. Implementing this alternative would likely cause some adverse effects from continued recreational activities creating temporary disturbances during spawning activities; therefore, this action would likely adversely affect razorback suckers and bonytail chubs.

Construction activities that could occur in or around desert tortoise habitat could likely adversely affect desert tortoises; however, mitigation measures would be in place prior to any construction activity, reducing potential adverse impacts to these species. Low-density and/or marginal habitat could be lost as a result of this alternative. Alternative C would not

likely jeopardize the continued existence of the desert tortoise, and is not likely to destroy or adversely modify designated critical habitat for the desert tortoise. The implementation of alternative C is not likely to adversely affect the desert tortoise.

There would be no impairment to threatened, endangered, or species of concern from the impacts resulting from this alternative.

Impacts on Cultural Resources. Site design and coordination with the cultural resources manager would ensure that no cultural resources were damaged under this alternative.

All areas of future development will be inventoried for cultural resources as required by 36 CFR part 800, and all cultural resources will be evaluated for eligibility to the National Register of Historic Places. If the project results in any adverse effects to cultural resources, the National Park Service will consult with the appropriate State Historic Preservation Office in the development of a mitigation plan.

There would be no impairment to cultural resources from the impacts resulting from this alternative.

Impacts on Visitor Use, Experience, and Safety. In general, visitor experience should improve with the implementation of this alternative. Visitor conflicts should decrease due to recreational zoning and the implementation of the 200-foot flat-wake zone proposed around beaches frequented by bathers, boats at the shoreline, and near people in the water and at the water's edge. Visitor safety and experiences should improve because of carrying capacity limitations and mandatory boater education requirements. Sanitation and litter programs, alcohol restrictions for boat operators, and the long-term implementation of uniform boating laws would also contribute to improved visitor experiences. Some visitors might be adversely impacted by recreational opportunity restrictions, such as the policy to prohibit motorized use (except electric trolling motors) in primitive areas and the restrictions on motorized use in the semiprimitive areas. This alternative allows carbureted two-stroke engine use, including personal watercraft, until the year 2012.

Impacts on Soundscapes. This alternative would provide a higher level of protection to the soundscape in the sensitive inflow areas than under alternatives A and D, but would not protect as large of an area as under alternative B. On Lake Mead, the inflow area of the Virgin River and the Gypsum Bed areas would

be designated as primitive areas, with nonmotorized uses only (except electric trolling motors) under this alternative. This would serve to protect the soundscape and natural quiet in those areas, which would be a beneficial effect on nonmotorized recreationists and the natural resources in those areas, including wildlife. The semiprimitive areas would be located in the Muddy River inflow area (Overton Wildlife Management area), Bonelli Bay, and Grand Wash Bay.

On Lake Mohave, the northern portion of Black Canyon above Willow Beach would have temporal zoning that would prohibit motorized use two days per week year-round. This would allow for the natural sounds to be the primary sounds during those periods, and would serve to benefit nonmotorized recreationists, as well as wildlife species in the canyon. Between Labor Day and Memorial Day, the area would be managed for a semiprimitive setting five days per week, and during the summer months between Memorial Day and Labor Day, the area would be managed for a rural natural setting.

The continued operation of the commercial raft tours and administrative patrols during those periods would create a minor impact, as the noise from these vessels would only be heard occasionally, and the primary sound would be the natural sounds. Considering the enabling legislation, the history of motorized vessel use at Lake Mead National Recreation Area, and the park's goals and objectives to protect park resources and values, some noise from this source of recreational use is appropriate. The continued use of motors would continue to have a moderate impact on the soundscape. Stricter regulations and the enforcement of the Nevada boating noise standards would reduce the noise from vessels operating over 75 A-weighted decibels when measured at the shoreline, independent of speed or distance. The elimination of carbureted two-stroke engines would also reduce noise. Impacts under alternative C would not result in impairment to the park's soundscape.

The continued use of motorized vessels, including personal watercraft, would create minor to moderate impacts on the soundscape in the high-use and development zones of Lakes Mead and Mohave. There would be beneficial impacts from eliminating motorized use in the primitive zones and restricting motorized use in the semiprimitive zones. However, it is likely that visitors to these areas could experience minor to moderate impacts as noise travels from adjacent zones. It is anticipated that the increase of the flat-wake zone from 100 feet to 200

feet would reduce noise to persons on the other side of the zone from 6 to 4 A-weighted decibels. While this alternative would protect more area than under alternatives A and D, it would protect less area than under alternative B. No impairment to park resources would occur as a result of the impacts from this alternative.

Impacts on Socioeconomic Resources. Except for prohibiting the sale of glass beverage containers and styrofoam within the recreation area, which could cause minor impacts from reduced income, concessioners (except the Willow Beach operation) should benefit from this **modified** preferred alternative due to increased park visitation and improved visitor facilities. Concessioners could benefit slightly from the sale or rental of portable toilets. Willow Beach **concessioners** could be negatively impacted by the temporal semiprimitive designation of Black Canyon and the reduction of motorized vessel use through the proposed restrictions. Concessioners located where expansion would be authorized could benefit from increased services and facilities. Adjacent communities could benefit from increased visitation to the recreation area.

The economy of adjacent communities and the region could benefit from the expected growth in visitation to the recreation area. However, businesses that rent or sell older model carbureted two-stroke engines and personal watercraft could be burdened with stock they could not sell. Businesses that sell or rent **direct-injection** two-stroke and four-stroke engines would benefit from the new requirements at the recreation area.

Impacts on Park Operations. According to the 1999 *Lake Mead National Recreation Area Business Plan* (NPS 1999a), recreation area management staff, and personnel audits conducted at Lake Mead National Recreation Area, approximately 157 additional full-time or seasonal positions would be required to effectively implement this alternative.

Impacts on Sustainability and Long-Term Management. Actions proposed under this alternative would not result in any significant loss of long-term productivity. The main actions that would cause direct impact on land resources relate to the proposed development of additional facilities at two locations within the recreation area and the expansion of several existing facilities. When evaluated on a broad scale, the amount of soils and vegetative resources that would be removed from the

construction areas is limited and small in scale. Although site development and expansion would cause an irretrievable commitment of soils, vegetation, and wildlife habitat, and these adverse impacts could not be avoided under this alternative, mitigation measures would serve to decrease the impacts, and the actions would not adversely affect the overall quality and productivity of the Mojave Desert ecosystem within the recreation area.

Sanitation requirements for portable toilets and the 2012 regulation preventing the operation of carbureted two-stroke engines could reduce potential impacts on water quality. The original riverine environment has been altered by the construction of the reservoirs and the invasion of exotic species such as tamarisk. Implementing this alternative would not amplify these impacts on the existing overall productivity of Lake Mead National Recreation Area.

Impacts of Alternative D: Baseline

Alternative D emphasizes growth with a corresponding reduction in the variety of recreational activities available in the recreation area. Facility expansion would be similar to that proposed under alternative C. Facility expansion for Lake Mohave would occur at Cottonwood Cove, and a new launch facility would be constructed at Eldorado Canyon. On Lake Mead, expansion would be authorized at Overton Beach, Echo Bay, Temple Bar, and Callville Bay. A new launch facility would be constructed at Stewarts Point.

Under this alternative, a greater percentage of the waters of the recreation area would be designated as urban park and urban natural with no areas designated as primitive or semiprimitive. Areas would be managed for a high-density recreational experience for boaters and lake users. Lakeshore zoning would be mandatory and exclusive and certain areas would be closed to overnight camping.

This alternative would allow for the continued use of all two-stroke engines and personal watercraft in all zones of Lakes Mead and Mohave, except where they are specifically prohibited with buoys or signs.

Impacts on Air Quality. Implementation of alternative D would impose no restrictions on the type of watercraft or engine used in the park. There would be a continuing reduction in the number of carbureted two-stroke engines on the lake as a result of EPA regulations on manufacturers.

Under alternative D, hydrocarbon (HC) emissions would be 659 tons in 2012. In the 2004 to 2012 period, the conversion to cleaner engines would result in HC emission reductions of approximately 259 tons per year. This reduction would continue in the years after 2012.

Under alternative D, there would be a net reduction in HC+NO_x emissions of approximately 246 tons per year in 2012, compared to the emissions in 2004, and a potential beneficial effect on regional ozone levels. The impact on human health from HC and NO_x would be minor in the long-term.

Long-term emissions of HC, PM₁₀, and PM_{2.5} would decrease, while emissions of NO_x and CO would increase under alternative D.

Alternative D would result in a potential reduction of regional ozone formation. This would lead to a potential reduction in the SUM06 index.

Based on the lack of evidence of ozone injury to plants and the anticipated reductions in ozone formation, but recognizing the existing SUM06 index, the estimated level of long-term adverse impact on air quality-related values from alternative D would be moderate.

The long-term adverse effects of these pollutants on visibility, as a result of implementation of alternative D, would be negligible.

Construction impacts from fugitive dust would be short-term and minor, as particulate emission impacts would be minimized by the use of dust-control measures. Potential lead or asbestos hazards from facility renovation would be avoided by the use of licensed contractors for testing and removal of materials, if necessary, in accordance with federal and state regulations.

The pollutant concentrations in the Lake Mead National Recreation Area would continue to be within national ambient air quality standards. No changes are expected in the class II airshed status, because motorized boating activity will not result in a violation of any national air quality standard.

Implementation of this alternative would not result in an impairment of the air quality resource.

Impacts on Geologic Resources and Soils. Development that occurs in previously undisturbed sites could impact soil resources. Impacts would

include soil compaction, which could lead to erosion and runoff. Revegetation and site design would help minimize these impacts. Overall, the impacts from the expansion of developed areas within the recreation area or the construction of new facilities or roads would, when combined, create moderate impacts. Due to the size of the recreation area and the large amount of protected geologic resources and desert soils, no impairment to soils or geologic resources would occur from the impacts resulting from this alternative.

Impacts on Water Resources. Under alternative D, water quality would likely improve in camping and high-use areas from the portable toilet requirements and the placement of additional restroom facilities. In the long-term, over the next 20 years, as carbureted two-stroke engines are replaced by direct-injection two-stroke and four-stroke engines, water quality in high-use areas should improve. However, until then, water quality in high-use coves during peak periods of use could experience minor to moderate impacts. There is the potential that activities related to sanitation and refueling could continue to create moderate to major impacts on water quality in high-use areas. Antidegradation standards could be surpassed during high-use periods, and certain areas could be temporarily or permanently closed to recreational use.

The total boating capacity for both lakes under alternative D is 5,800 boats at any one time. In 2004 at Lake Mead, a maximum threshold volume of approximately 226,000 acre-feet, or about 11% of the available mixing volume, would be required to meet water quality standards. This would be considered a negligible to minor adverse impact.

With further reduction in emissions in the year 2012 at Lake Mead, maximum threshold volume would decrease to approximately 166,000 acre-feet, or about 8% of the available mixing volume.

The maximum threshold volume of water required to meet water quality standards at Lake Mohave in 2004 would be 193,000 acre-feet, or about 28% of the available mixing volume. This would also be considered a negligible to minor adverse impact.

The reduction in emissions at Lake Mohave in 2012 would require a maximum threshold volume of 130,000 acre-feet, or about 19% of the available mixing volume.

The impact to water quality would be negligible to minor; however, in confined areas, such as coves with high watercraft use, impacts could be detectable but would still be within water quality standards or criteria. Effects would be long-term because they would recur annually during the summer heavy-use season; however, water quality would remain within historical or desired water quality conditions.

Implementation of this alternative would not result in an impairment of the water quality resource.

Impacts on Vegetation Including Shoreline Vegetation. Minor impacts on vegetation would occur on a localized basis around construction sites. Topsoil would be removed prior to construction and replaced afterwards, where feasible, to save the seedbase and assist with restoration. Revegetation and landscaping with native vegetation would occur to replace vegetation. Because of the small size of the impact area compared with the size of the resource base, no impairment to the vegetative community would occur. Sensitive plant habitat could be slightly damaged by occasional visitor use in shoreline areas. Sensitive plant habitat would be monitored and additional levels of protection due to increased recreational activities would be implemented if deemed necessary by park resource managers. The impacts on vegetation from the implementation of this alternative would not impair the overall resource base of Lake Mead National Recreation Area.

Impacts on Wildlife and Wildlife Habitat. Wildlife would be temporarily displaced from the expansion areas due to construction activities. Wildlife species at construction sites that could not move from the area could be destroyed by construction activities. However, this impact would be considered minor due to the amount of similar habitat available nearby.

This alternative would provide for minimal protection of wildlife species within the recreation area from the use of motorized vessels in sensitive and important habitat. Sensitive species, particularly birds, around inflow areas could continue to be disturbed by the use of motorized vessels, even with the no-wake regulation. Nesting bird habitat could be impacted from the continued use of motorized vessels within sensitive roosting and nesting areas in the recreation area. However, the impacts of implementing this alternative would not impair the wildlife in the recreation area.

Impacts on Threatened and Endangered Species. There could be potential adverse impacts from this

alternative on threatened or endangered species, but mitigation measures should serve to reduce or eliminate any potential impacts. Monitoring would occur on threatened and endangered fish species, and special zoning on either lake might be implemented if determined necessary by park biologists in consultation with fisheries managers. The 300-foot flat-wake zone could have a beneficial impact on threatened and endangered species or habitat located in shoreline areas.

Under the evaluation of section 7 of the *Endangered Species Act*, the determination has been made that this alternative would have no effect on the California brown pelican and would not likely adversely affect the bald eagle, peregrine falcon, Yuma clapper rail, Western snowy plover, or Southwestern willow flycatcher. Implementing this alternative would likely cause some adverse effects from continued recreational activities creating temporary disturbances during spawning activities; therefore, this action would likely adversely affect razorback suckers and bonytail chub. However, additional protection might be provided through the implementation of the 300-foot shoreline flat-wake zone.

Due to the nature of proposed construction activities within desert tortoise habitat, there is the potential to adversely effect the desert tortoise from direct take or the loss of burrows or other habitat features.

There would be no impairment to threatened, endangered, or species of concern from the impacts resulting under this alternative.

Impacts on Cultural Resources. Site design and coordination with the cultural resources manager would ensure that no cultural resources are damaged under this alternative. There would be no impairment to cultural resources from the impacts resulting from this alternative.

All areas of future development will be inventoried for cultural resources as required by 36 CFR part 800, and all cultural resources will be evaluated for eligibility to the National Register of Historic Places. If the project results in any adverse effects to cultural resources, the National Park Service will consult with the appropriate State Historic Preservation Office in the development of a mitigation plan.

Impacts on Visitor Use, Experience, and Safety. Visitor experience would likely deteriorate with the implementation of this alternative. Visitor conflicts

should decrease due to recreational zoning and the implementation of the 300-foot shoreline flat-wake zone, but the additional restrictions might limit visitor use and create visitor dissatisfaction. Safety should improve with the proposed restrictions, including prohibited alcohol use and the 300-foot flat-wake zone, but safety might eventually deteriorate as overcrowding and congestion occur both on the lake and at adjacent facilities.

Visitors would not have the full spectrum of opportunities to enjoy a variety of recreational settings within the recreation area. This could cause certain visitors to be dissatisfied with their recreational experience.

Impacts on Soundscapes. Considering the enabling legislation, the history of motorized vessel use at Lake Mead National Recreation Area, and the park's goals and objectives to protect park resources and values, some noise from this source of recreational use is appropriate. Noise from motorized vessels would continue to have a moderate impact on the soundscape in all areas of Lakes Mead and Mohave. Under this alternative, the National Park Service would promulgate a special regulation to prohibit all motorized vessels that operate at 75 A-weighted decibels or above. The 300-foot flat-wake zone could reduce noise from motorized vessels at the shoreline, although some boats are louder while idling and operating at flat-wake speeds than while cruising at normal speeds. Impacts under alternative D would not result in impairment to the park's soundscape.

Impacts on Socioeconomic Resources. Eliminating the sale of alcoholic beverages, glass containers, and styrofoam within the recreation area could negatively impact park concessioners. Increased park visitation and the authorized expansion could benefit park concessioners. Adjacent communities could benefit from increased visitation to the recreation area.

Businesses that sell or rent personal watercraft and other two-stroke engines would not be negatively impacted by this alternative.

Impacts on Park Operations. According to the 1999 *Lake Mead National Recreation Area Business Plan* (NPS 1999a), recreation area management staff, and personnel audits conducted at Lake Mead National Recreation Area, approximately 169 additional full-time or seasonal positions would be required to implement this alternative.

Impacts on Sustainability and Long-Term Management. The impacts associated with this alternative would be similar to those under alternative C, but they could potentially create a higher level of impact, primarily due to zoning differences. Allowing increased visitor use along the lakeshore in urban natural and urban park zones would focus visitation and impacts on these areas. The increased visitation would be concentrated along the shoreline and would not impact the overall productivity of the Mojave Desert ecosystem.

The continued unrestricted use of carbureted two-stroke engines until after many become inoperable after 2025 could adversely impact the water quality of the lakes, and recreational water quality standards could be exceeded during certain periods at high-use areas. It is uncertain whether this impact on water quality would be an irreversible or irretrievable commitment of resources; however, it could cause immediate impacts by forcing area closures, and there is the potential that reduced water quality could harm aquatic organisms with algae blooms, suspended solids and turbidity, and oxygen depletion.

TABLE ES-6: COMPARISON OF LONG-TERM IMPACTS UNDER EACH ALTERNATIVE

Impact Topic	Alternative A (No Action)	Alternative B	Alternative C (Modified Preferred Alternative)	Alternative D (Baseline)
Air quality	Some beneficial effects	Some beneficial effects	Some beneficial effects	Minor to moderate adverse impacts
Geologic resources and soils	Potentially minor to moderate adverse impacts	No impacts	Potentially negligible adverse impacts	Potentially minor adverse impacts
Water resources, including sensitive aquatic resources	Moderate adverse impacts	Some beneficial effects	Some beneficial effects	Minor to moderate adverse impacts
Vegetation, including shoreline vegetation	Minor adverse impacts	Negligible to minor adverse impacts	Potentially some beneficial effects	Minor adverse impacts
Wildlife and wildlife habitat	Minor to potentially major adverse impacts	Some beneficial effects	Some beneficial effects	Minor to potentially major adverse impacts
Threatened and endangered species	Minor to moderate adverse impacts; potentially beneficial impacts to sensitive habitat	Some beneficial impacts	Some beneficial impacts	Minor to moderate adverse impacts
Cultural resources	No impacts	No impacts	No Impacts	No Impacts
Visitor use, experience, and safety	Moderate to major adverse impacts	Some beneficial effects; potentially moderate adverse impacts	Some beneficial effects	Moderate to major adverse impacts
Soundscapes	Moderate adverse impacts	Slight beneficial effects; moderate adverse impacts	Slight beneficial effects; moderate adverse impacts	Moderate adverse impacts
Socioeconomic resources	Potentially major adverse impacts	Some slight beneficial effects; potentially moderate adverse impacts	Some slight beneficial effects; potentially moderate adverse impacts	Some slight beneficial effects; potentially minor adverse impacts
Park operations	Potentially moderate to major adverse impacts	Potentially moderate adverse impacts	Potentially moderate adverse impacts	Potentially moderate adverse impacts

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Purpose of and Need for the Plan

INTRODUCTION

The National Park Service (NPS) is considering implementing a lake management plan within the Lake Mead National Recreation Area to improve the management of Lakes Mead and Mohave, while allowing for a range of recreational opportunities and providing for the long-term protection of park resources.

This section describes the purpose and need for the action; provides an overview of the [management history](#) of the recreation area, including related planning documents, policies, regulations, and laws; provides information on the topics analyzed under each alternative; and identifies issues and impacts related to lake management.

This *Final Environmental Impact Statement / Lake Management Plan* presents the no-action alternative and three action alternatives for managing Lakes Mead and Mohave, as well as alternatives that have been ruled out and the justifications for their elimination.

PROJECT SITE LOCATION

Lake Mead National Recreation Area includes two reservoirs (Lakes Mead and Mohave) along 140 miles of the former Colorado River from the southern tip of Nevada to the northwest corner of Arizona. It contains portions of Clark County, Nevada, and Mohave County, Arizona (figure 1).

Lake Mead National Recreation Area is bounded on the north by the town of Overton, Nevada, the Virgin Mountains, and the Shivwits Plateau; on the east by Grand Canyon National Park and [land administered by the Bureau of Land Management \(BLM\)](#); on the south by Bullhead City, Arizona, and Laughlin, Nevada; and on the west by Boulder City, Nevada, the Eldorado Mountains, and the Newberry Mountains. [The recreation area](#) is generally associated with the city of Las Vegas, Nevada, which lies approximately 20 miles to the northwest (figure 2).

The recreation area contains 1,501,216 acres, of which 1,484,159 acres are in federal ownership administered by the National Park Service and 12,568 are nonfederal lands. An additional 4,488 acres surrounding Hoover and Davis Dams are administered by the Bureau of Reclamation. Lake

Mead National Recreation Area is the fourth largest unit of the national park system outside the state of Alaska. Federal acreage divided by state reflects 60% of the park is located in Arizona and 40% is located in Nevada.

The area surrounding Lakes Mead and Mohave is rugged with deep canyons, dry washes, sheer cliffs, and mountains. Improved access to the shore of the lakes is limited (figure 1). Northshore Road provides access to the Callville Bay, Echo Bay, and Overton Beach developed areas along the western edge of Lake Mead. Lakeshore Road is the most heavily used road in the park and provides access to the Alan Bible Visitor Center, Boulder Beach, and Las Vegas Bay developed areas on the southwestern portion of Lake Mead.

U.S. Highway 95 on the west extends the length of Lake Mohave, and spur roads provide access to the Cottonwood Cove developed area and to the Eldorado Canyon overlook. A number of unimproved roads also provide access to the vast backcountry of the Eldorado and Newberry Mountains. On the east, U.S. Highway 93 provides the main transportation link with spur roads leading to Willow Beach on Lake Mohave, and Temple Bar, South Cove, and Pearce Ferry on the eastern portion of Lake Mead [and the western edge of Grand Canyon National Park](#). Katherine Landing, at the southernmost end of Lake Mohave, is located just north of Davis Dam and is accessed by Nevada Highway 163 off of U.S. Highway 95 and by Arizona Highway 68 off of U.S. Highway 93.

The recreation area is located in one of the fastest growing regions of the United States. It is within a half-day drive of the large metropolitan area in southern California and within a one-day drive of population centers in Utah and Arizona. These states provide the largest number of visitors to Lake Mead National Recreation Area from outside Nevada. A total of over 9 million visitors were recorded in 2001.

Southern Nevada, Arizona, southern California, and southern Utah are the major points of origin for many of the Lake Mead National Recreation Area water-based recreationists. However, the adjacent attractions of Las Vegas and Laughlin, Nevada, draw people from throughout the nation, as well as international visitors, many of whom visit Lake Mead National Recreation Area while they are in the area.



FIGURE 1: PROJECT LOCATION — LAKE MEAD NATIONAL RECREATION AREA

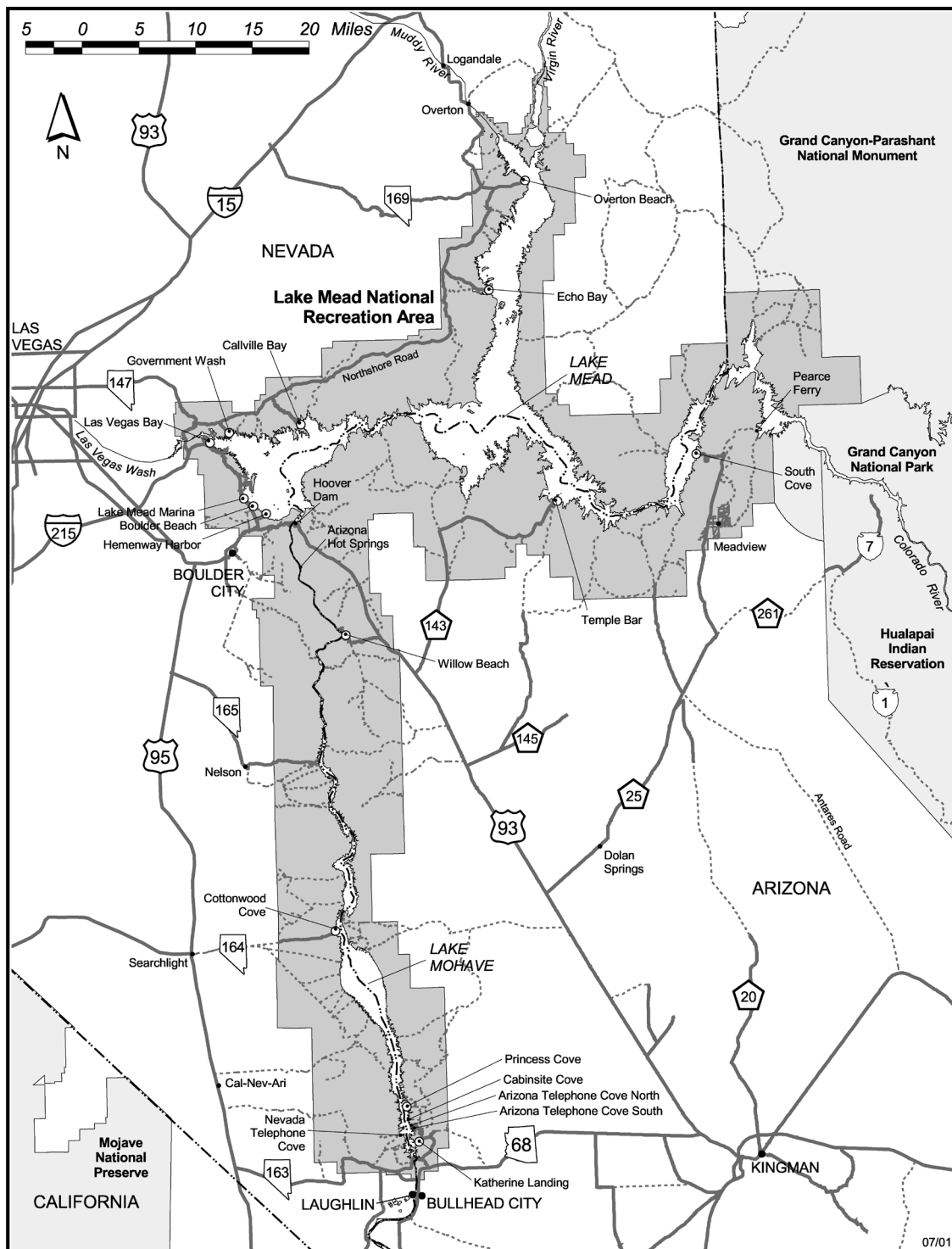


FIGURE 2: REGIONAL MAP OF PROJECT LOCATION — LAKE MEAD NATIONAL RECREATION AREA

Concurrent with the expanding service industries in Las Vegas and Laughlin, and with the trend of increasing population in the “sunbelt” states, Clark County, Nevada (which includes both Las Vegas and Laughlin), experienced a 36% increase in population between 1990 and 2000 (Clark County 2001). Not included in these population figures are the seasonal “snowbird” visitors who spend a portion of the winter in this area. The pressures of increasing visitation and regional population growth have created numerous challenges for the future management of Lake Mead National Recreation Area, its resources, and the opportunities for public recreational experiences.

PURPOSE AND NEED

In 1986 the *Lake Mead National Recreation Area General Management Plan* (NPS 1986) established land-based management zones and strategies for meeting the goals and general purposes of the recreation area. Since that time, management issues have surfaced that have not been adequately addressed or resolved in previous planning efforts. These issues relate to the increase in recreational use of the lakes, visitor conflicts and safety, potential impacts on park resources from water-related recreation, and personal watercraft use.

The overall objective of this *Lake Management Plan* is to improve the management of Lakes Mead and Mohave, while providing for the long-term protection of park resources and allowing a range of recreational opportunities to support visitor needs. This environmental impact statement evaluates alternatives and strategies for protecting the resources and values of the Lake Mead National Recreation Area, while offering recreational opportunities as provided for in the park’s enabling legislation, purpose, mission, and goals. A special analysis on the management of personal watercraft is provided under each alternative to meet the terms of the settlement agreement between Bluewater Network and the National Park Service.

Specifically, this environmental impact statement evaluates four alternatives for managing the Lake Mead National Recreation Area. The analysis considers recreational opportunity zoning, shoreline zoning, developed areas and facilities, recreational services, recreational conflicts, sanitation and litter, resource protection, park operations, and personal watercraft use. An overview of these topics is provided below, and an in-depth analysis is presented

under each alternative in the “Alternatives [Selected for Analysis](#)” chapter of this document.

Recreational Opportunity Zoning

The recreational opportunity spectrum has been used to develop a range of alternatives within five recreational settings: primitive, semiprimitive, rural natural, urban natural, and urban park. Table 1 describes the settings, the expected conditions, and the NPS services that would be provided within each setting. The descriptions are not intended to be absolute, and there may be some features common to more than one setting.

Zone Descriptions. One of the unique features of Lake Mead National Recreation Area is the diversity of water-based recreational settings users can experience. The settings range from quiet solitude to faster, more social experiences. With over 180,000 acres of water, lake users are generally assured of finding opportunities to engage in a variety of experiences well into the future. The water management zones described below summarize the conditions, features, facilities, and types of experiences for each zone.

Primitive Setting — Users in this management zone may encounter a small number of other boaters/people engaged in low-impact activities. Opportunities for solitude characterize this zone, while allowing for a variety of recreational activities. There is limited evidence of human impact on the landscape. Only nonmotorized watercraft and electric trolling motors (operating at flat-wake speeds or less than 5 mph) are authorized in this zone. Watercraft speeds will be kept low to preserve the area’s tranquil qualities. Noise levels will be low. No roads or commercial operations exist or are authorized. Activities in this zone are more self-reliant, as NPS patrols are infrequent. Abundant opportunities for quiet and tranquil exploration and fishing are available.

Semiprimitive Setting — Users in this management zone will occasionally encounter other boaters/people engaged in limited impact activities. Opportunities to experience a sense of peace and quiet are available, and there is some expectation of solitude. Noise levels will be low, as watercraft will be limited to flat-wake speeds or 65-horsepower engines. Personal watercraft use is prohibited. There is limited evidence of human impact on the landscape, with the exception

TABLE 1: RECREATIONAL OPPORTUNITY SPECTRUM — LAKE MEAD NATIONAL RECREATION AREA

Primitive Setting	Semiprimitive Setting	Rural Natural Setting	Urban Natural Setting	Urban Park Setting
No roads, structures, facilities, or commercial services.	Unmaintained dirt or four-wheel-drive-vehicle road access. Dispersed camping area. Commercial services originating outside the zone.	Main access roads maintained, facilities primarily limited to National Park Service for lake access and use. Primitive campgrounds with designated sites. Commercial services originate outside the zone.	Paved access roads. Developed campground with section zoned for tent camping. Limited range of commercial facilities and services available. Limited range of commercial boating services available.	Paved roads. Fully developed campgrounds with hookups. Shoreline camping under permit. Full array of commercial facilities and services available.
Boats using electric trolling motors only (and operating at flat-wake speeds or less than 5 mph). Water activities that are supported by nonmotorized boats.	Boating and water activities restricted to flat-wake speeds or 65-horsepower engines. Personal watercraft prohibited. Electric trolling motors allowed.	Some types of boating and water activities are restricted. There are no special restrictions in this zone.	Time and location restrictions on waterskiing, wakeboarding, or tubing due to boat densities.	High level of boating and water activity, and highest levels of controls on boating. Time and location restrictions on waterskiing, wakeboarding, or tubing due to boat densities.
Restricted numbers, low visitation, rare human contact.	Occasional contact with visitors and other boaters.	Encounters with visitors and other boaters common.	Encounters with other visitors frequent, crowding and conflict are the exception.	Intense visitor use with congestion and high social contact. Conflicts expected.
Mechanical noise and lighting originate outside the zone.	No permanent lighting, no generators.	Lighting only for security and safety purposes. Noise expected during daylight hours, minimal noise at night.	Lighting provided for safety and security.	Artificial lighting, motorized vessels originating in the area, traffic noise expected into the night.
Natural-appearing landscape with pristine views.	Landscape appears natural except in access areas.	Natural landscape predominant with some manmade features.	Landscape modified with emphasis on natural features.	Highly modified landscape, buildings, graded beaches, and landscaping visible.
No expectation of NPS services, emergency services, law enforcement, interpretation, or maintenance; no scheduled patrols.	National Park Service responds to emergencies, infrequent patrols.	Patrols scheduled but occasional; response originates outside the zone with limited emergency services; law enforcement, maintenance, and interpretive services available.	Full range of emergency services; law enforcement, maintenance, and interpretive services available; patrols regular and frequent.	Full range of emergency services; law enforcement, maintenance, and interpretive services available; patrols regular and frequent.

of gravel roads that access the shoreline. Some degree of self-reliance is necessary due to the remoteness of the area. There are abundant opportunities for exploration and fishing.

Rural Natural Setting — Users in this zone will commonly encounter other boaters/users throughout the zone. There are no restrictions on boat type or speed. Because these zones are distant from the primary launch areas, noise levels will be moderate. Commercial services are authorized in this zone, and NPS patrols are occasional and scheduled. The zone provides for a mix of recreational opportunities for all water-based activities, including exploration, waterskiing, wakeboarding, tubing, and fishing.

Urban Natural Zone — Users in this zone will frequently encounter other visitors and may experience crowding and conflict. Due to the higher levels of recreational activity, users may experience high noise levels in this zone, which may be continuous during the daylight hours but should decrease with nightfall. The landscape is modified but limited to support lake access, including public launch ramps and smaller concession-operated marinas. The zone provides for a mix of recreational opportunities for all water-based activities including exploration, waterskiing, wakeboarding, and fishing. There may be times and locations when waterskiing, wakeboarding, or tubing may be limited due to boat densities.

Urban Park Zone — Users in this zone will encounter intense visitor use with expectation of crowding and conflict on summer weekends. Higher noise levels may be experienced in this zone and may extend into the night due to the proximity to urban areas and adjacent traffic on highways and access roads. The landscape is modified to reflect the development of a full range of commercial services associated with marinas, launch ramps, campgrounds, trailer villages, and picnic areas. The zone provides for a mix of recreational opportunities for all water-based activities, including exploration, waterskiing, wakeboarding, and fishing. The shoreline areas within this zone may be zoned for specific activities to address conflict between the various shoreline users. During summer weekends, opportunities for waterskiing, wakeboarding, and tubing may be limited due to boat densities throughout the zone.

Shoreline Zoning

Shoreline zoning has been in place at Boulder Beach on Lake Mead for several years. Certain areas have mandatory zoning where only specific activities can take place, such as the SCUBA park. Other areas have voluntary zoning where the area is recommended for certain activities, such as the ski beach. Alternatives for shoreline zoning in the urban park zones are evaluated in this *Lake Management Plan* to determine if such zoning would reduce visitor conflict and increase visitor safety and satisfaction, while ensuring a wide range of recreational opportunities exist in these areas.

Developed Areas and Facilities

There is a need to identify facility improvement, capacity, location, and expansion for the developments that control lake access. Fluctuating reservoir levels have placed some facilities at risk from exposure to high winds and waves. Facility modernization is needed as the design life for many facilities has been exceeded, and maintenance costs continue to increase. Facility development must match the lake carrying capacity.

Recreational Services

With the rapid growth along the boundary of the recreation area, there is a need to define which services should be provided within the park and which services could best be accommodated outside the park. These issues are addressed in “Appendix A: Commercial Services Plan.”

Recreational Conflict

A range of recreational opportunities and settings exist within the recreation area. There is a need to define recreational opportunities and establish management prescriptions that will address conflicting uses and ensure a wide range of recreational opportunities exist in the future.

Sanitation and Litter

Shoreline sanitation, indiscriminant deposition of human wastes, and litter (particularly glass and styrofoam) are critical factors influencing visitor satisfaction.

This *Lake Management Plan* identifies a range of options that focus on the reduction of shoreline litter, the improvement of shoreline sanitation, and the development of appropriate utility services and infrastructure required to meet this objective.

Resource protection — Recreational use of the lakes has the potential to impact cultural, traditional, and natural resources. This *Lake Management Plan* addresses issues related to water quality, air quality, soundscape and noise pollution, shoreline vegetation management, habitat enhancement for fisheries, the protection of endangered species habitat, the protection of sensitive bird nesting areas, the protection of cultural and traditional sites along the shoreline, and the protection of bighorn sheep habitat and other habitat accessible from the lake.

Park operations — Park operations and management practices are evaluated, as well as alternatives addressing the frequency and number of law enforcement patrols, the specific rules for

recreational activities, the maintenance of facilities, such as launch ramps, water systems, sewage systems, and marinas, and the cleanliness of facilities, such as restrooms and other shoreline facilities.

Personal watercraft use — Regarding personal watercraft use, the purpose of and the need for taking action is to evaluate a range of alternatives and strategies for the management of personal watercraft use at Lake Mead National Recreation Area to ensure the protection of park resources and values, while offering recreational opportunities as provided for in the recreation area's enabling legislation, purpose, mission, and goals. Upon completion of the process outlined in the *National Environmental Policy Act of 1969* (NEPA), the National Park Service may either take action to adopt special regulations to manage personal watercraft use at Lake Mead National Recreation Area or discontinue personal watercraft use at the unit as allowed for in the National Park Service March 2000 rule (36 CFR 3.24).

BACKGROUND

In 1992 park managers determined that the development of a lake management plan was necessary to address issues surfacing from increased visitation to Lakes Mead and Mohave. The first step in developing a lake management plan was to initiate a study to establish a baseline inventory of physical, biological, and social factors influencing the quality of the recreational experience at Lake Mead National Recreation Area. The primary emphasis was on documenting existing conditions, evaluating the social and environmental acceptability of these conditions, and identifying probable causes and potential solutions to problems or unacceptable conditions. The major components of the study included a recreational use inventory, an environmental/biological inventory, and a social/visitor experience inventory. Extensive public scoping enhanced the study. The inventory was completed in 1994, and the analysis was completed in 1997 (Graefe and Holland 1997). A summary of the results is found in “Appendix B: Analysis of Recreational Carrying Capacity.” The inventory and analysis provided the framework to develop alternatives for managing visitor use, facilities, and park resources within the management zones located in and adjacent to Lakes Mead and Mohave.

PARK-SPECIFIC LEGISLATION AND PLANNING DOCUMENTS

The enabling legislation for Lake Mead National Recreation Area (Public Law [PL] 88-639) established the recreation area “for the general purposes of public recreation, benefit, and use, and in a manner that will preserve, develop and enhance, so far as practicable, the recreation potential, and in a manner that will preserve the scenic, historic, scientific, and other important features of the area, consistent with applicable reservations and limitations relating to such area and with other authorized uses of the lands and properties within such area.” The Secretary of the Interior was authorized under the act to provide for general recreational use. General recreational use was defined within section 4(b) of this legislation and included bathing, boating, camping, and picnicking.

The 1986 *General Management Plan* (NPS 1986) provided the overall management direction for Lake Mead National Recreation Area. The plan established management zones to accommodate increasing

visitor use while protecting park resources. However, many of the current issues were not anticipated and are, therefore, not addressed in the *General Management Plan*.

The 1993 *Lake Mead National Recreation Area Statement for Management* (NPS 1993b) identified the need for a lake management plan, and the 1998 *Lake Mead National Recreation Area Strategic Plan* (NPS 1998c) established goals relating to resource protection, public enjoyment, and visitor satisfaction. The 2001 *NPS Strategic Plan* (NPS 2001b) has reaffirmed these goals.

The 1999 *Resource Management Plan* (NPS 1999c) and State of the Park Report for Lake Mead National Recreation Area identify threats to park resources, including impacts on water quality from concentrated recreational use in coves; impacts on water quality in harbors and in high-use lakeshore areas; impacts on water quality from the discharge of municipal runoff and treated effluent, with attendant industrial and medical chemical wastes such as perchlorate, methyl tertiary butyl ether, benzene, and endocrine disruption compounds; deterioration of air quality from the use of powerboats, the operation of carbureted two-stroke engines, and from the high volume of traffic in developed areas; backcountry and lakeshore sanitation, including human waste and litter; and visitor competition for shoreline camping. The *Resource Management Plan* also identified the major resource issues relative to Lakes Mead and Mohave, including water quality threats, the protection of threatened and endangered species and rare plant species; and the development of water management and monitoring programs.

SERVICEWIDE LEGISLATION AND PLANNING DOCUMENTS

The *National Park Service Organic Act of 1916* directs the National Park Service to manage units “to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such a manner as will leave them unimpaired for the enjoyment of future generations.” Congress reiterated this mandate in the *Redwood National Park Expansion Act of 1978* by stating that the National Park Service must conduct its actions in a manner that will ensure no “derogation of the values and purposes for which

these various areas have been established, except as may have been or shall be directly and specifically provided by Congress.” The *Organic Act* prohibits actions that permanently impair park resources unless a law directly and specifically allows for the acts. An action constitutes an impairment when its impacts “harm the integrity of park resources or values, including the opportunities that otherwise would be present for the enjoyment of those resources and values” (NPS 2001c, Section 1.4.3).

NPS *Management Policies* (NPS 2001c) require the analysis of potential effects under each alternative to determine if actions would impair park resources. To determine impairment, the National Park Service must evaluate “the particular resources and values that would be affected; the severity, duration, and timing of the impact; the direct and indirect effects of the impact; and the cumulative effects of the impact in question and other impacts.” The National Park Service must always seek ways to avoid or minimize, to the greatest degree practicable, adverse impacts on park resources and values. However, the laws do give the National Park Service management discretion to allow impacts on park resources and values when necessary and appropriate to fulfill the purposes of a park, as long as the impact does not constitute impairment to the affected resources and values (NPS 2001c, Sections 1.4.3, 1.4.4).

NPS units vary based on their enabling legislation, natural and cultural resources, missions, and the recreational opportunities appropriate for each unit or for areas within each unit. An action appropriate at Lake Mead National Recreation Area, as designated by the enabling legislation, might impair resources in another unit. This environmental impact statement analyzes the context, duration, and intensity of impacts related to recreational use, including personal watercraft use, at Lake Mead National Recreation Area, as well as the potential for resource impairment, as required by *Director’s Order 12: Conservation Planning, Environmental Impact Analysis and Decision Making* (NPS 2000a).

OVERVIEW OF RECREATIONAL USE AND PERSONAL WATERCRAFT USE

Lake Mead was created after the water began to back up behind Hoover Dam in 1935, filling completely in 1941. Hoover Dam not only impounded the waters of Lake Mead, it also created vehicular access over the Colorado River between Arizona and southern

Nevada. At that time, the population of the community of Las Vegas was less than 50,000.

By 1937 the estimated visitor use of Lake Mead was 552,128. In the 1950s Davis Dam was completed, and Lake Mohave began to fill. Area visitation reached 1 million for the first time in 1946, 2 million in 1953, and 3 million in 1963.

Water-based recreation during these early periods was primarily divided between shoreline use and boating. Boating activities included exploration of the newly formed reservoirs and fishing. The early boats were primarily constructed of wood and were small in size. They were vulnerable to winds in the open basins of lakes, and boat swamping was the predominate boating accident recorded.

Lake Mead National Recreation Area was formally established by Congress in 1964. From that time to the 1970s, visitation jumped to 6 million, and there was a corresponding increase in boating activity. Lake Mead was being discovered as one of the premier inland water recreation areas. During this period, boat construction was greatly improved, and the majority of boat hulls were manufactured with fiberglass. This greatly improved safety and reduced the boat swamping incidents.

With the improved safety of boats on the water, the diversity of recreational activities increased. Exploration and fishing continued to be popular, but waterskiing and speedboating activities were increasing on both lakes.

Personal watercraft, primarily stand-up models, were first observed on Lakes Mead and Mohave in the mid-1970s. In the 1980s the first sit-down models were available with one- or two-person capacities. During this time, personal watercraft were manufactured by four companies, and the first personal watercraft consumer magazines were published. The typical cost of a personal watercraft was \$6,600.

From the mid-1980s through the mid-1990s, sales grew rapidly, then leveled off starting in the mid-1990s. According to visitor use surveys in 1993, the use of personal watercraft at Lake Mead National Recreation Area during this time constituted 15% of the boats on the water at any one time. A rapid increase in personal watercraft was observed at the recreation area starting in 1994, when use jumped to 30% of the boats on the water at any one time.

Today monitoring shows that personal watercraft use constitutes 35% of the boats on the water at any one time. There are 11,000 personal watercraft registered in Clark County, Nevada, and thousands more in the region surrounding Lake Mead National Recreation Area. The highest densities are observed in the urban interface areas of the lakes — the Boulder Basin of Lake Mead and in the lower portion of Lake Mohave. The Personal Watercraft Industry Association believes that, through the year 2002, most personal watercraft output is between 155–165 horsepower (PWIA 2001). Some models are capable of carrying up to three passengers, and some can pull a skier and carry an observer.

Personal watercraft congregate in shoreline accessible areas and usually operate within 0.5 mile of the shoreline. A typical party will include two personal watercraft and six to eight individuals. A base camp is established along the shoreline, and personal watercraft use is rotated among the group. On Lake Mead, use is concentrated at Horsepower Cove, Saddle Cove, and Government Wash. Each of these sites is accessible by vehicle and is within 30 minutes of the Las Vegas Valley. Similarly, on Lake Mohave, use is concentrated at Arizona and Nevada Telephone Coves and Cabinsite Point. Due to the narrow configuration of the lower portion of Lake Mohave, personal watercraft users must share the waters with other boaters, sometimes resulting in boating conflicts.

Personal watercraft are often used as tag-alongs with other boats. It is not uncommon to see personal watercraft being towed behind a houseboat as part of a houseboat vacation. Seldom are personal watercraft seen entering the more remote portions of the lake without the support of another vessel. Towable trailers are available for personal watercraft, which allow users to bring camping gear and fuel to support their visit. These trailers are rarely observed on Lakes Mead or Mohave.

The average operating life of a personal watercraft is 5 to 10 years, depending upon the source. The formula for determining the operating life of personal watercraft was published in the *Federal Register* on October 4, 1996 (EPA 1996a). Based on this formula, the National Park Service expects that by 2012, most boat owners will already be in compliance with the 2006 EPA marine engine standards. The Personal Watercraft Industry Association believes the typical operating life of a personal watercraft rental is 3 years and approximately 5 to 7 years for a privately owned vessel. The majority of personal watercraft

used today are powered by conventional two-stroke engines (California Air Resources Board [CARB] 2001). The Personal Watercraft Industry Association notes that direct-injection engines have been available in personal watercraft for four years, and three personal watercraft manufacturers introduced four-stroke engines for the 2002 model year (PWIA 2001). The Environmental Protection Agency assumes that the existing two-stroke engine models would not be completely replaced by newer personal watercraft technology until 2050 (EPA 1996a). The 2006 compliant personal watercraft with direct-injection engines are available locally and comprise a significant percentage of new personal watercraft sales. The 1996 EPA rule to control exhaust emissions from new marine engines, including outboards and personal watercraft, are expected to reduce hydrocarbon emissions by 50% from present levels by the year 2012, with a 75% reduction by 2030 (EPA 1996a).

PERSONAL WATERCRAFT USE REGULATORY BACKGROUND

More than one million personal watercraft¹ are estimated to be in operation today in the United States. Sometimes referred to as “jet skis” or “wet bikes,” these vessels use an inboard, internal combustion engine powering a water jet pump as its primary source of propulsion. They are used for transportation and enjoyment and are capable of speeds in the 60-mph range. Personal watercraft were once the fastest growing segment of the boating industry and represented over 30% of all boat sales.

The National Park Service maintains that personal watercraft emerged and gained popularity in park units before it could initiate and complete a “full evaluation of the possible impacts and ramifications.” While personal watercraft use remains a relatively

1. Personal watercraft, as defined in 36 CFR §1.4(a) (2000), refers to a vessel, usually less than 16 feet in length, which uses an inboard, internal combustion engine powering a water jet pump as its primary source of propulsion. The vessel is intended to be operated by a person or persons sitting, standing, or kneeling on the vessel, rather than within the confines of the hull. The length is measured from end to end over the deck excluding sheer, meaning a straight line measurement of the overall length from the foremost part of the vessel to the aftermost part of the vessel, measured parallel to the centerline.

new recreational activity, it has occurred in 32 of 87 park units that allow motorized boating.

The National Park Service first began to study personal watercraft in Everglades National Park. The studies showed that personal watercraft use over emergent vegetation, shallow grass flats, and mud flats damaged the vegetation, adversely impacted the shore birds that fed on the vegetation, and disturbed the life cycles of other wildlife. Consequently, managers at Everglades National Park determined that personal watercraft use remained inconsistent with the resources, values, and purposes for which the park was established. In 1994 the National Park Service prohibited personal watercraft at the park through a special regulation (59 FR 58,781).

Other public entities have taken steps to limit, and even to ban, personal watercraft use in certain waterways as national researchers continue to study the effects of personal watercraft use. At least 34 states have either implemented or have considered regulating the use and operation of personal watercraft (63 FR 49,314). Similarly, various federal agencies, including the U.S. Fish and Wildlife Service and the National Oceanic and Atmospheric Administration, have managed personal watercraft differently than other classes of motorized watercraft.

Specifically, the National Oceanic and Atmospheric Administration regulates the use of personal watercraft in most national marine sanctuaries. The regulation resulted in a court case where the court of appeals for the District of Columbia declared management specific to personal watercraft use valid. In *Personal Watercraft Industry Association v. Department of Commerce*, 48 F.3d 540 (D. C. Cir. 1995), the court ruled that an agency can discriminate and manage one type of vessel (specifically personal watercraft) differently than other vessels if the agency explains its reasons for the differentiation.

In February 1997 the Tahoe Regional Planning Agency, the governing body charged with ensuring no derogation of Lake Tahoe's water quality, voted unanimously to ban all two-stroke, internal combustion engines, including personal watercraft, because of their effects on water quality. The ban at Lake Tahoe began in 2000.

In recognition of its duties under the *Organic Act* and *NPS Management Policies*, as well as increased awareness and public controversy, the National Park Service reevaluated its methods of personal watercraft regulation. Historically, the National Park

Service grouped personal watercraft with all vessels; thus, people could use personal watercraft when the unit's superintendent's compendium allowed the use of other vessels. Later the Park Service closed seven park units to personal watercraft use through the implementation of horsepower restrictions, general management plan revisions, and park-specific regulations such as those promulgated by Everglades National Park.

In May 1998 the Bluewater Network, a coalition of more than 70 organizations, filed a petition urging the National Park Service to initiate the rulemaking process to prohibit personal watercraft use throughout the national park system. In response to the petition, the Park Service issued an interim management policy requiring superintendents of parks where personal watercraft can occur, but where they have never occurred, to close the parks to personal watercraft use until the rule was finalized. In addition, the National Park Service proposed a specific personal watercraft regulation premised on the notion that personal watercraft differ from conventional watercraft in terms of design, use, safety record, controversy, visitor impacts, resource impacts, horsepower-to-vessel-length ratio, and thrust capacity (63 FR 49, 312–17, Sept. 15, 1998).

The National Park Service envisioned the servicewide regulation as an opportunity to evaluate impacts from personal watercraft use before authorizing the use. The preamble to the servicewide regulation calls the regulation a “conservative approach to managing personal watercraft use,” considering the resources concerns, visitor conflicts, visitor enjoyment, and visitor safety. During a 60-day comment period, the National Park Service received nearly 1,800 comments [on the proposed regulation](#).

As a result of public comments and further review, the National Park Service promulgated an amended regulation that prohibited personal watercraft use in most units and required the remaining units to determine personal watercraft appropriateness for continued use (36 CFR 3.24(a), 2000; 65 FR 15,077–90, Mar. 21, 2000). Specifically, the regulation allowed the National Park Service to designate personal watercraft areas and to continue their use by promulgating a special regulation in 11 park units, including Lake Mead National Recreation Area, and by amending the units' superintendents' compendiums in 10 park units (36 CFR 3.24(b)). The National Park Service based the distinction between designation methods on the units' degree of motorized watercraft use.

In response to the personal watercraft final regulation, Bluewater Network sued the National Park Service under the *Administrative Procedures Act* and the *Organic Act*. The organization challenged the NPS decision to allow continued personal watercraft use in 21 park units while prohibiting personal watercraft use in other park units. In addition, the organization also disputed the NPS decision to allow 10 park units to continue personal watercraft use after 2002 by making entries in superintendents' compendiums, which would not require the opportunity for public input in the rulemaking process. Further, the environmental group claimed that because personal watercraft cause water and air pollution, generate increased noise levels, and pose public safety threats, the National Park Service acted arbitrarily and capriciously when making the challenged decisions.

In response to the suit, the National Park Service and the environmental group negotiated a settlement. The resulting settlement agreement, signed by the judge on April 12, 2001, changed portions of the NPS personal watercraft rule. While 21 park units can continue personal watercraft use in the short-term, each of those parks desiring to continue long-term personal watercraft use must promulgate a park-specific special regulation in 2002. In addition, the settlement stipulates that the National Park Service must base its decision to issue a park-specific special regulation to continue personal watercraft use through an environmental analysis conducted in accordance with the *National Environmental Policy Act* (NEPA). According to the settlement agreement, the NEPA analysis must, at a minimum, evaluate personal watercraft impacts on water quality, air quality, soundscapes, wildlife, wildlife habitat, shoreline vegetation, visitor conflicts, and visitor safety.

In 2001 the National Park Service adopted its new management policy for personal watercraft. The policy prohibits personal watercraft use in NPS units unless their use remains appropriate for the specific park unit (NPS 2001b, Section 8.2.3.3). The policy statement authorizes the use based on the park's enabling legislation, resources, values, other park uses, and overall management strategies.

On September 5, 2002, the National Park Service published a draft rule for the operation of personal watercraft at Lake Mead National Recreation Area. The draft rule for personal watercraft use is based on alternative C (the preferred alternative) in the *Draft Environmental Impact Statement / Lake Management*

Plan (now the modified preferred alternative in this *Final Environmental Impact Statement*). The 60-day public comment period on the draft rule ran from September 5 to November 4, 2002.

The proposed September 16, 2002, prohibition of personal watercraft was averted with the execution of a stipulated modification to the settlement agreement. The modified settlement agreement was approved by the court on September 9, 2002, and extends unrestricted personal watercraft use in selected NPS units until November 6, 2002.

The modified settlement agreement included a further extension of personal watercraft use at Lake Mead National Recreation Area until December 31, 2002. Certain areas (zones 6, 7, 9, 15, 18, 23, and 24) as identified in this *Final Environmental Impact Statement / Lake Management Plan* are closed to personal watercraft between November 7 and December 31, 2002. In addition, a 200-foot shoreline flat-wake zone would be established in zones 3, 4, 13, 14, 15, 16, 19, 21, and 22, as identified in this *Final Environmental Impact Statement / Lake Management Plan*. Under the modified settlement agreement, the National Park Service is required to evaluate the operation of all fueling facilities on Lakes Mead and Mohave. If a final rule is not published by December 31, 2002, personal watercraft would be prohibited until such time the final rule is published.

OTHER PLANS, POLICIES, AND ACTIONS CONSIDERED

Commercial Services Plan

The Lake Mead National Recreation Area *Commercial Services Plan* (appendix A) provides guidelines for assessing the changing conditions and increasing pressures of visitor needs and adopting a strategy that balances visitor needs with the purposes and values of the recreation area unit. The *Commercial Services Plan* evaluates the existing management strategy and ensures that, under the proposed alternatives, a range of visitor services would be provided, and valuable natural and cultural resources would be protected.

Concessions Contract

These are agreement(s) between the Secretary of the Interior, or authorized delegate, and a concessioner,

whereby the concessioner is required and authorized to provide certain necessary and appropriate visitor accommodations, facilities, or services within a park unit under administration of the secretary. The secretary authorizes concession operations by both contracts and permits. Concession contracts are issued via competitive bid, and it is anticipated that within the next three years, prospectuses will be released for new contracts for all park concession operations.

Handicapped Access and Parking

All new recreational facilities are developed in accordance with the *Americans with Disabilities Act Accessibility Guidelines* (Recreation Facilities, 36 CFR part 1191). The National Park Service is currently conducting an accessibility assessment of buildings and recreational facilities parkwide to determine what is needed to bring existing facilities up to current standards. Regarding handicapped parking, spaces are provided at each of the developed areas throughout the park and at the top of launch ramps. It would be neither practical nor safe to authorize parking on the launch ramps because of the 9% to 14% grades, as it is difficult to exit a vehicle on those grades and difficult to open and close doors.

Partnership and Funding Initiatives

The four federal agencies (National Park Service, Bureau of Land Management, U.S. Fish and Wildlife Service, and U.S. Forest Service) managing the public lands adjacent to the city of Las Vegas, work with a private support foundation called Outside Las Vegas Foundation. The purpose of Outside Las Vegas Foundation is to increase the appreciation of these public lands by the residents of Las Vegas. The agencies hope that increased appreciation will lead to greater personal responsibility for protecting public resources, as well as increased support, financially and otherwise, for resource protection.

The *Southern Nevada Public Land Management Act of 1998* provides funding for improving the recreational infrastructure on public lands in Clark County from the sale of BLM-administered lands in the Las Vegas Valley. The recreation area collects entrance fees and boating use fees; 80% of those fees collected are returned to the park and used to improve park infrastructure.

Lake Mead National Recreation Area is partnering with the Nevada Division of Wildlife, Arizona Game and Fish Department, and the Bureau of Reclamation to provide improved recreation facilities. Funding provided through the Sport Fish Restoration Program, the Clean Vessel Act, State Lake Improvement Fund, and the Reclamation Recreation Act have been used for the construction of new launch ramps, restrooms, fish cleaning stations, courtesy docks, floating boat-pump-out stations, first-aid stations, and parking areas.

Other funding initiatives include the Arizona State Lake Improvement Funds, the Arizona Boating Access Fund, the *Sport Fish Restoration Act*, the *Reclamation Recreation Act of 1992*, and the *Transportation Equity Act of the 21st Century*. These funds are granted for the improvement of recreational facilities, such as boat ramps and shoreline facilities in Arizona.

Other potential sources include the Multispecies Habitat Conservation Program and the Lower Colorado River Habitat Conservation Plan.

Bureau of Reclamation Surplus Water Criteria

In December 2000 the Secretary of the Interior, acting through the U.S. Bureau of Reclamation, adopted interim criteria under which surplus water conditions may be declared in the lower Colorado River Basin. Beginning in calendar year 2002, the interim surplus criteria were initiated, and they will extend through 2016. The impacts of this action on the recreation area operations are summarized in “Appendix C: Summary of Operations under Forecasted Water Elevations.”

EPA Final Rule for Gasoline Spark-Ignition Marine Engines

As directed under section 213 of the *Clean Air Act*, as amended in 1990 (CAA 1990), the Environmental Protection Agency passed a regulation on December 3, 1996 (EPA 1996a), to regulate exhaust emissions from new spark-ignition gasoline marine engines (including outboard engines, personal watercraft engines, and jet boat engines) because exhaust emissions from spark-ignition gasoline marine engines cause or contribute to ozone in more than one ozone nonattainment area (an area that does not meet the national ambient air quality standards for ozone). Once the program is fully implemented,

the manufacturers of these engines must demonstrate to the Environmental Protection Agency that hydrocarbon emissions are reduced by 75% from present levels through testing engines representative of the product line before sale and after use. The result of these regulations will be a new generation of cleaner gasoline marine engines that will be available to boaters.

The emission standards were phased in beginning with the 1998 model year and will be fully implemented in the 2006 model year. The emission standard is being phased in to provide time to develop new technology.

Systems Conveyance and Operations Program

This ongoing planning process will address water quality issues and concerns related to the discharge of treated effluent and wastewater from the Las Vegas Valley into Las Vegas Wash. An environmental impact statement is being developed by the National Park Service and the Bureau of Reclamation, in cooperation with the Clean Water Coalition, to evaluate alternatives, including alternative discharge points, to ensure future protection of the waters of Lake Mead and the lower Colorado River system.

Las Vegas Bay Marina Relocation Environmental Assessment

In September 2002, low-water conditions and the expanding delta in the Las Vegas Bay forced the National Park Service and marina operators at the Las Vegas Boat Harbor to evaluate alternatives related to the temporary relocation of the marina. An environmental assessment was released to determine the short-term and interim options for a marina relocation or potential closure. A final decision was made for the interim location in late September, and marina operations were moved to Horsepower Cove in early October (management preferred alternative). The marina operation will remain in Horsepower Cove until an amendment to the *Lake Mead National Recreation Area General Management Plan* is prepared that will address all low-water concerns related to concession operations on Lake Mead.

Amendment to the Lake Mead National Recreation Area General Management Plan

Low-water issues have resulted in substantial impacts to park and concession-operated facilities on Lake Mead. Park managers have determined that an amendment to the *General Management Plan* is required to address the existing and potential future low-water conditions at Lake Mead and how they affect park operations and marina management. This planning process is expected to start in early 2003 and will be completed in approximately two to three years.

Other Requirements Considered

The National Park Service will comply with federal and state regulations related to the *Clean Air Act* and regulations related to hazardous materials, including asbestos and lead contaminants.

State of Nevada Boater Education Law

In August 2001 the state of Nevada amended chapter 488 of the *Nevada Revised Statute*, adding provisions for mandatory boater education for persons born on or after January 1, 1983 (*Nevada Boat Act*). The amendment sets forth education and certification requirements for those persons who will operate a motorized vessel having a motor that exceeds 15 horsepower on any interstate waters of Nevada, including Lakes Mead and Mohave. This amendment becomes effective on January 1, 2003.

Homeland Security

Security zones were established with the completion of Hoover Dam and Davis Dam. Within these zones, the Bureau of Reclamation has exclusive jurisdiction. Following the events of September 11, 2001, additional security measures were implemented that restrict travel upstream and downstream of Hoover Dam and limit vehicular travel across Hoover Dam. Security measures are continually being evaluated and may be modified in the future.

ISSUES AND IMPACT TOPICS

In January 1993 public meetings were initiated to help identify and summarize significant issues related to the management of Lakes Mead and Mohave. A notice of intent to prepare a lake management plan and environmental impact statement for Lake Mead National Recreation Area was published in the *Federal Register* on May 3, 1993. Between January 1993 and September 2000, a series of public scoping meetings, public information meetings, and presentations on the development of the lake management plan were held throughout the area. A complete listing of the meeting dates and locations is found in “Appendix D: Chronology of Lake Management Plan Public Meetings and Presentations,” and more detailed information on public involvement is found in the “Consultation and Coordination” part of this document.

The National Park Service interdisciplinary planning team identified the following potential issues through the public meetings, internal and external scoping, and the aforementioned settlement agreement.

Air quality — Increased dust from construction activities and exhaust emissions from construction equipment could create temporary, localized impacts on air quality. These air quality concerns are primarily related to particulate matter.

Personal watercraft emit various compounds that pollute the air. In the two-stroke engines commonly used in personal watercraft, the lubricating oil is used once and is expelled as part of the exhaust; and the combustion process results in emissions of air pollutants such as hydrocarbons (HC), nitrogen oxides (NO_x), particulate matter (PM₁₀ and PM_{2.5}), and carbon monoxide (CO). Personal watercraft also emit fuel components such as benzene that are known to cause adverse health effects. Even though PWC engine exhaust is usually routed below the waterline, a portion of the exhaust gases go into the air. These air pollutants may adversely impact park visitor and employee health, as well as sensitive park resources. For example, in the presence of sunlight, HC and NO_x are ozone precursors. Ozone causes respiratory problems in humans, including cough, airway irritation, and chest pain during inhalations (EPA 1996b). Ozone is also toxic to sensitive species of vegetation. It causes visible foliar injury, decreases plant growth, and increases plant susceptibility to insects and disease (EPA 1996b). Carbon monoxide can affect humans as well. It interferes with the

oxygen carrying capacity of blood, resulting in lack of oxygen to tissues. NO_x and particulate emissions associated with personal watercraft use can also degrade visibility (EPA 2000). NO_x can also contribute to acid deposition effects on plants, water, and soil.

Although there is existing data showing that two-stroke engines emit pollutants into the air, there is little data that shows specifically what impacts personal watercraft emissions have on air quality. It is expected, however, that the 1996 EPA rule concerning the manufacture of carbureted two-stroke engines (EPA 1996a), including those used in personal watercraft, would result in reduced air emissions and thus improved air quality.

Geology/soils — The development of new facilities in previously undisturbed areas would alter or remove existing soil strata and surface drainage, resulting in accelerated erosion. Fluctuating lake levels could lead to shoreline erosion.

Water resources — Runoff from construction sites could affect water quality. Water quality, area aesthetics, and public health would be improved due to improvements in litter control and lakeside sanitation.

The vast majority of personal watercraft in use today are powered by carbureted two-stroke engines that discharge as much as 30% of their fuel directly into the water (CARB 1999, NPS 1999d). Oil and gas emissions release hydrocarbons; benzene, toluene, ethylbenzene, and xylenes (collectively, BTEX); polycyclic aromatic hydrocarbons (PAH); and methyl tertiary butyl ether (MTBE). These discharges have the potential to adversely affect water quality, the health of people, and aquatic organisms, particularly in high-use confined areas. Every water body has different conditions (e.g., water temperature, air temperature, water mixing, motorboat use, and winds) that affect the level of impact from pollutants (Oregon Department of Environmental Quality [ODEQ] 1999).

Lake Mead provides drinking water for the Las Vegas Valley, so protecting the water quality of the lake is important. The water intake that delivers drinking water to Las Vegas Valley is located at an elevation of 1,050 feet above mean sea level, and the

lake surface is usually above 1,180 feet, putting the intake at a depth of 130 feet or more.

Vegetation and shoreline vegetation — Vegetation would be removed or disturbed during construction activities.

Shoreline vegetation along Lake Mead consists primarily of nonnative salt cedar (*Tamarix spp.*). The shoreline vegetation along Lake Mohave is also dominated by salt cedar, but there are periodic stands of native willows and cottonwood trees. Removal of salt cedar would occur at selected areas around the lakes. Native riparian species could be restored to selected areas around the lakes if transplant efforts are successful.

Access to shoreline areas by motorized vessels, including personal watercraft, could lead to the disturbance of sensitive plant species. Sensitive plants species that grow in sandy areas could be trampled by recreational use of these areas.

Wildlife and wildlife habitat — Wildlife could be disturbed by the noise and activity levels around construction sites and would likely avoid these areas during construction. Available wildlife habitat could be reduced by the construction of additional facilities or developed areas. Important wildlife habitat for birds and other species could be protected if these areas are zoned for primitive or semiprimitive use or are protected by seasonal closures.

Access to shoreline wildlife habitat by motorized vessels, including personal watercraft, could disturb wildlife by interrupting normal activities, resulting in the alarm or flight response, the avoidance and displacement of habitat, and effects on reproductive success. Of particular importance at Lake Mead National Recreation Area is bird habitat at the inflow areas of the Colorado, Muddy, and Virgin Rivers and along portions of Lake Mohave. The Muddy River inflow in the Overton Wildlife Management Area has restricted use under the management of the Nevada Division of Wildlife. Personal watercraft are able to access the sensitive areas around Lake Mohave and the inflow areas of the Virgin River and Colorado River at high rates of speed, while other motorized vessels either cannot access the areas or must access them at flat-wake speeds. The combination of personal watercraft speed, noise, and the ability to access shallow shoreline areas can disrupt riparian habitat areas critical to wildlife.

Some literature suggests that noise from personal watercraft could have a greater impact on wildlife in the inflow areas than noise from other types of watercraft because of their speed and ability to access shallow water areas more readily. This could force waterfowl and other shorebirds from their nests and habitat, causing nest abandonment, stress, and associated behavioral changes.

Wildlife in these sensitive inflow areas would be protected from disturbance by motorized vessels, including personal watercraft, if these areas were zoned for flat-wake speeds or zoned to restrict motorized vessels.

Threatened and endangered species — Threatened and endangered species may exist in or near proposed development or expansion sites. Available habitat could be reduced from proposed construction activities.

The use of motorized vessels, including personal watercraft, could disturb threatened and endangered species that occupy habitat close to or within Lake Mead and Lake Mohave.

Threatened and endangered habitat could be protected in the sensitive inflow areas if the lakes were zoned for primitive use in those areas.

Cultural resources — Unknown cultural resources could exist in areas proposed for development and could be disturbed by construction activities. Increased visitation to significant shoreline cultural or traditional areas by motorized vessels, including personal watercraft, could impact the integrity of these sites.

Soundscapes — Park soundscapes include both natural and human components. The natural soundscape is considered a park resource. Park natural soundscapes include all the naturally occurring sounds in the park, not including any sounds of human origin. At Lake Mead National Recreation Area, the natural soundscape would include such natural sounds as wind in the trees, thunder, quiet, birds calling, rocks falling, animals moving, streams flowing, and waves on the lake caused by wind.

Human-caused sounds at Lake Mead National Recreation Area include all types of watercraft (including personal watercraft), automobiles and trucks, aircraft, generators, and electronic devices (such as boom boxes and horns). Noise from

construction activities and watercraft could negatively impact visitors and natural and cultural resources.

Personal watercraft most likely comply with noise standards, and the 1999 personal watercraft models are reported to be quieter than the 1998 models (PWIA 2001). However, the nature of the noise generated from personal watercraft may be more disturbing than noise from other watercraft operating at similar decibel levels. Personal watercraft tend to be operated closer to shore, operated in confined areas, and used in groups. Frequent changes in pitch and rapid changes in acceleration and direction typical of the operation of personal watercraft can create noise that can be disturbing to other recreationists.

Potential noise impacts on wildlife are discussed in the wildlife section.

Visitor use and experience — The visitor experience could improve if conflicts between visitors are reduced, litter is reduced, sanitation is improved, and recreational opportunities are enhanced. The visitor experience could be temporarily affected by activities related to the construction of new facilities.

Some research suggests that visitors believe that personal watercraft use creates conflicts among recreational user groups, mainly due to their noise, speed, and the manner in which they are used. Other visitors believe that personal watercraft are no different than other motorized vessels. Nevertheless, conflict can occur between personal watercraft users and other recreationists, and this can lead to visitor dissatisfaction.

Safety — The use of motorized vessels, including personal watercraft, can lead to unsafe conditions due to reckless operation, operation at high speeds, operation in storms or inclement weather conditions, unsafe operation in high-density boating areas, and operation by uneducated and/or inexperienced users.

The operation of personal watercraft can be dangerous due to the nature of the watercraft. Personal watercraft have limited turning capabilities when not under propulsion. This characteristic has been one of the chief factors in personal watercraft-related accidents. Manufacturers are working to resolve this issue. In addition, personal watercraft can operate at high speeds close to the shoreline. This practice can create unsafe conditions and safety

hazards to other users, including swimmers, canoeists, and kayakers.

Improved education and information services for park visitors and coordinated law enforcement efforts may contribute to a decrease in visitor injuries, fatalities, and search-and-rescue operations. Shoreline [flat-wake](#) zoning would reduce the risk to shoreline users.

Park operations — An improvement to existing facilities and an increase in visitor services and facilities would increase demands on park operations. Improved or new facilities could result in an increase in park visitation. An increase in staff would be necessary to protect resource values, maintain the setting and facilities, educate the public, and enforce the laws and regulations.

Socioeconomic resources — According to the Money Generation Model, an economic model for estimating the money that is generated through the development of recreation facilities, the Lake Mead National Recreation Area contributes approximately \$500 million annually to the regional economy. Improved visitor facilities and services could result in an increase in park visitation, which could translate into an overall increase in tourist dollars to concession operations around the lakes and nearby communities and could add to the regional economy.

Businesses that sell or rent motorized vessels may be impacted by the EPA 2006 emission requirements. Businesses could benefit from the sale and service of [direct-injection](#) two-stroke and four-stroke engines and personal watercraft. Rental businesses could be negatively impacted if they have to replace their rental fleet with engines that are in compliance with the new regulations.

ISSUES CONSIDERED BUT DISMISSED FROM FURTHER CONSIDERATION

Issues related to the management of the Lower Granite Gorge of Grand Canyon National Park were considered in the planning process. Significant issues included recreational opportunities in the Lower Granite Gorge, upstream commercial travel, camping for boaters originating from Lake Mead National Recreation Area, the group size of commercial tours originating from Lake Mead National Recreation Area, and other recreational activities including restrictions on motorized craft. These issues [were not](#) addressed in this planning process, but will be

PURPOSE OF AND NEED FOR THE PLAN

addressed through a separate Colorado River planning process.

The outflow of Las Vegas Wash, including treated effluent and run-off from the Las Vegas Valley, was brought up as an issue in relation to water quality and marina operations in Las Vegas Bay. It was determined that the issues involved with Las Vegas Wash are outside the scope of this planning effort. The National Park Service is working with several coordination committees around the Las Vegas area to maintain the quality and integrity of the treated wastewater and reduce impacts to Lake Mead. This alternative discharge option issue will be addressed in an environmental impact statement for the Systems Conveyance and Operations Program.

The following issues were reviewed in the planning process but were considered not appropriate for this planning project.

The alternatives are not within the proposed wilderness boundaries within the recreation area. No impacts would occur on wetlands or wild and scenic rivers because none of these areas occur within the proposed project area.

The proposed activities are exempt from NPS floodplain guidelines (NPS 1993a) because the actions addressed in this plan are functionally dependent upon the waters of Lakes Mead and Mohave.

No impacts would occur on low-income populations or prime and unique agricultural lands.

OBJECTIVES IN TAKING ACTION

The overall objective of this *Lake Management Plan* is to ensure the protection of the recreation area's natural and cultural resources, values, and purpose while allowing a broad range of recreational opportunities to enhance visitor experience. This objective relates directly to the Lake Mead National Recreation Area [Mission Statement](#) outlined in the 2001 *Lake Mead National Recreation Area Strategic Plan* (NPS 2001b), [which is to provide diverse inland water recreational opportunities in a spectacular desert setting for present and future generations](#). The primary goal set forth in the *Strategic Plan* is to protect, restore, and maintain in good condition the natural and cultural resources and associated values of Lake Mead National Recreation Area and to manage these resources and values within the broader ecosystem and cultural context.

This goal encompasses the broad mandates of the NPS *Organic Act* and includes the concepts of biological and cultural diversity and the perpetuation of natural processes within the park. In reality, Lake Mead National Recreation Area functions as part of a larger, dynamic system, and humans and their culture, through time, must be considered part of the system. The *Strategic Plan* emphasizes the importance of adopting ecosystem management as a management philosophy and the need to assess and identify the recreation area's multiple ecosystem boundaries and scales (variable zones of influence) including environmental, cultural, social, and economic factors, such as watershed, wildlife habitat, and floral ranges. The National Park Service is directed to actively engage in collaborative planning and management activities within the defined variable zones of influence.

Under this broad goal and mission statement are several goals that relate specifically to the management of the lake environment.

Nonnative plant species and shoreline vegetation — Shoreline vegetation along most of Lakes Mead and Mohave comprises nonnative species such as tamarisk. Along Lake Mohave there are pockets of native riparian vegetation, such as willows and cottonwoods. Nonnative plant species threaten these resources because they often replace native species, disrupt natural processes, and otherwise destroy natural systems. By eliminating or geographically containing the targeted species, the National Park Service can help restore natural systems. The primary

focus within Lake Mead National Recreation Area over the next five years will be on nonnative species within riparian areas associated with park springs and selected shoreline areas of Lake Mohave.

Threatened and endangered species and species of concern — Under the NPS *Organic Act* and the *Endangered Species Act*, federal agencies are required to develop programs for conserving listed species. In consideration of these acts, the *Strategic Plan* gives responsibility to the National Park Service for knowing the condition of its resources and for tracking the status and stability of the populations of federally listed threatened and endangered species that were identified by the year 1997. These populations consist of those threatened and endangered species with critical habitat on parklands, as well as those species requiring NPS recovery actions. The *Strategic Plan* outlines strategies for preserving, protecting, restoring, maintaining, monitoring, and evaluating the habitat of all threatened and endangered species in the park and for mitigating any impacts that affect critical habitat or the populations of threatened and endangered species. In particular, the plan provides management strategies for the razorback sucker, including the implementation of the Native Fish Work Group action plan for razorback sucker recovery actions. The National Park Service is directed to coordinate with the Bureau of Reclamation and U.S. Fish and Wildlife Service on the annual monitoring of [Southwestern](#) willow flycatcher nesting areas in the Virgin and Muddy Rivers and potential willow flycatcher areas on Lake Mohave.

Although there are no listed plant species within Lake Mead National Recreation Area, there are species of special concern. One objective of managing plant species of special concern is to coordinate surveys and assess the need for protection measures.

Wildlife — The National Park Service is directed to manage species of special concern that are not federally listed as threatened, endangered, or nonnative by coordinating or conducting surveys for special status wildlife species and assessing the need for protection measures. These include species identified in the *Resource Management Plan*, [Lake Mead National Recreation Area](#) (NPS 2001d) as having special significance to the recreation area or species on adjacent lands managed by other state or

federal agencies where park habitat supports those species. These include charismatic species and state-listed sensitive species as well as focus species of the Clark County Multi-Species Conservation Program and the Lower Colorado River Multi-Species Conservation Program.

Water quality — The National Park Service **is required** under law to protect the surface and subsurface waters of Lakes Mead and Mohave. Water quality within Lakes Mead and Mohave is threatened by external sources, such as the Las Vegas Wash and the Virgin and Muddy Rivers, and internal sources, such as treated park wastewater, human sanitation, and **fuel** from boats and personal watercraft. The highest established standard for water quality in both Nevada and Arizona is for swimming (full body contact). Fishing is an important visitor activity with established water quality standards. The park has adopted those standards as the desired condition for 98% of the park. The standard is set at 98%, rather than the desired future goal of 100%, due to current conditions at the confluence of Las Vegas Wash. The park is working toward this longer-term goal.

Cultural resources — Under the *Strategic Plan*, the National Park Service is directed to perform surveys and condition assessments of cultural resources. To preserve recorded archeological sites, monitoring is necessary, and additional actions to enhance preservation may be required. Under this goal, the number of recorded archeological sites for Lake Mead National Recreation Area that are listed in good condition on the 1999 Archeological Sites Management Information System would be increased from 10% to 50%. Good condition indicates that the site is not deteriorating due to natural processes such as erosion, or human impacts such as vandalism or looting. The plan addresses the need to protect natural and cultural resources from any illegal activity occurring within the recreation area boundary, such as violations of the *Archeological Resources Protection Act of 1979*, illegal off-highway vehicle activity, plant and animal poaching, illegal hunting, vandalism, and hazardous material spills and dumping. The plan also addresses the need to monitor known cultural sites to prevent human-caused disturbances.

Visitor experience and opportunities — Under the *Strategic Plan*, enjoyment of the recreation area and its resources is a fundamental part of the visitor experience. Visitor enjoyment and safety are affected by the quality of recreation area programs, facilities, and services, whether provided by the National Park

Service, concessioners, incidental business operators, or contractors.

Visitor safety — Under this goal of the *Strategic Plan*, the National Park Service is directed to provide the visitor with a safe and secure visit. They are responsible for maintaining, monitoring, and evaluating the park facilities that are there for the protection of the park visitor. The National Park Service is required to provide services that directly contribute to the safety and security of the visitor, such as protection, search and rescue, criminal investigation, and emergency medical and fire, and to identify, investigate, and correct or mitigate sources of injury and property damage experienced by the visiting public.

Safety at Lake Mead National Recreation Area has been an issue of great concern. Although there are a number of possible measures to evaluate the effectiveness of improving the safety and security of visitors, the measurement adopted was to reduce the visitor safety incident rate by 10% from the 1997 level.

In addition to the goals set forth in the *Strategic Plan*, the *Lake Mead National Recreation Area Resource Management Plan* (NPS 1999c) identified goals and objectives for the management of park resources, as well as threats to these resources, including air quality.

Air quality — Although a class II area, air quality at Lake Mead National Recreation Area is still one of the best in the country from both health and visual aspects. Visitors, especially those from urban areas with a highly polluted atmosphere, value the good air quality and visibility still found here. However, one of the threats identified that could potentially lead to the deterioration of air quality over the park is powerboats and the operation of personal watercraft.

PLANNING OBJECTIVES

Specific planning objectives related to the management of Lakes Mead and Mohave were considered when developing the alternatives for this *Lake Management Plan*. These objectives are as follows:

Provide a range of water-oriented recreational opportunities — Lake Mead National Recreation Area contains over 150,000 acres of surface water that support water-based recreation. The area

includes primarily large open basins but also contains narrow and secluded canyons. One of the objectives of this planning effort is to zone the waters for a variety of recreational experiences ranging from primitive to urban. The alternatives will be evaluated on the mix of recreational settings proposed.

Provide a quality recreational setting — The goal within each of the proposed recreational settings is to provide a quality recreational setting including a clean shoreline with appropriate sanitation precautions. The use levels within each zone should be predictable so visitors can match their recreational activity with a specific recreational setting. Each alternative will be evaluated on how it addresses the quality of the recreational setting.

Reduce water and shoreline conflict — There are a variety of conflicts occurring between user groups both at the shoreline and on the water. Each alternative offers specific actions to address the conflict between user groups. The alternatives will be evaluated on how they address the shoreline and water conflict issues.

Identify the public and commercial services/facilities needed — There is a need to establish a foundation for the level of commercial services provided at Lakes Mead and Mohave. Each of the alternatives

provides a range of recreational settings and the levels of development necessary to support those settings. These levels are presented in the form of marina and public launch ramp capacities. The alternatives will be evaluated on the mix of recreational settings provided and the level of commercial and public development necessary to support that mix.

Protect the natural and cultural resources of the recreation area — One of the key elements in maintaining a quality recreational setting is protecting the resources that make the recreational visit enjoyable. These elements include the scenic as well as the physical, biological, and cultural resources. Each of the alternatives will be evaluated on how it protects these resources.

Identify the operational needs to manage lake recreation — There is a need to publicize the operational shortfall of the National Park Service in its administration of Lake Mead National Recreation Area. Generally, the staffing numbers are not easily available to the public. This plan identifies the staffing needed for each of the alternatives and summarizes it for the public. The alternatives will be evaluated for the staffing impacts on park operations.

Alternatives selected for Analysis

DESCRIPTION OF ALTERNATIVES

In response to the management issues identified in the “Purpose of and Need for the Plan” chapter of this environmental impact statement, four alternatives for managing the waters and associated shoreline areas of Lake Mead National Recreation Area are presented. The alternatives were developed by the interdisciplinary planning team of Lake Mead National Recreation Area. The team developed the criteria to characterize the recreational opportunity spectrum zoning and then mapped the zones on Lakes Mead and Mohave. The next step included developing the desired future conditions and alternatives to achieve those conditions. Once the alternatives were drafted, the team met with a wide variety of user groups to seek feedback on the alternatives. In 1998, five public meetings were held and the alternatives were presented to the public. Following these public informational meetings, the alternatives were modified to the four that were presented in the *Draft Environmental Impact Statement*. Regarding personal watercraft use, the alternatives range from prohibiting personal watercraft under alternative A to unrestricted use of personal watercraft under alternative D. Each alternative identifies proposed actions related to recreational opportunity zoning and shoreline zoning, developed areas, facilities and recreational services, recreational conflict, sanitation and litter, resource protection, and park operations. Table 2 presents a comparison of the actions proposed under the four alternatives.

In April 2002 the *Draft Environmental Impact Statement / Lake Management Plan* was released for public review in a formal 60-day comment period. Approximately 10,000 comment letters were received from public agencies, individuals, organizations, and businesses. The National Park Service interdisciplinary planning team evaluated the comments to determine if modification to the alternatives was warranted and if further analysis of issues and impacts was required. The introduction to “Volume 2: Comments and Responses,” provides an explanation of the process the Park Service used to evaluate comments. In response to public input during the review period, Alternative C (the preferred alternative) was modified slightly, and changes are identified under alternative C (the modified preferred alternative) in this *Final Environmental Impact Statement*.

In addition new information provided during the comment period has been included in each alternative’s impacts discussion in the “Environmental Consequences” chapter of this *Final Environmental Impact Statement*.

ELEMENTS COMMON TO ALL ALTERNATIVES

Application of recreational opportunity zoning — Under each alternative, the lake and shoreline areas are zoned according to a recreation opportunity spectrum (ROS) matrix that characterizes five recreational settings: primitive, semiprimitive, rural natural, urban natural, and urban park. A description of the settings are presented in table 1.

Development of a parking and circulation plan for each development area — Many of the development areas depend on gravel areas for circulation and parking. There is a need to evaluate each of the developed areas for circulation and parking. Parking design and layout would be dependent on the alternative selected.

Use of physical, environmental, and social carrying capacity measures — Each alternative utilizes boating carrying capacities for each zone based on studies conducted prior to the preparation of this plan.

The boating carrying capacity was established in the *Lake Mead National Recreation Area General Management Plan* (NPS 1986) by setting development capacities for each marina including the number of slips, rental boats, and dry boat storage spaces. The determining factor for capacity was the amount of surface water in the harbors as social crowding had not been identified as a planning constraint in the early 1980s. Data collected in 1993 and 1994 indicate that portions of the lakes were operating at or above social capacities during the summer holiday weekends at most launch sites and occasionally at Callville Bay and Katherine Landing on nonholiday summer weekends. These data were reaffirmed in the 1998 surveys conducted by the Nevada Division of Wildlife and the annual boating inventories conducted by the National Park Service.

TABLE 2: COMPARISON OF THE ALTERNATIVES

Program Elements	Alternative A (No Action)		Alternative B		Alternative C (Modified Preferred Alternative)		Alternative D (Baseline)	
Recreational Opportunity Zoning								
Percentage of Lake Mead by zone	Primitive	0%	Primitive	11%	Primitive	1%	Primitive	0%
	Semiprimitive	0%	Semiprimitive	0%	Semiprimitive	4%	Semiprimitive	0%
	Rural Natural	0%	Rural Natural	46%	Rural Natural	45%	Rural Natural	25%
	Urban Natural	39%	Urban Natural	18%	Urban Natural	15%	Urban Natural	24%
	Urban Park	61%	Urban Park	25%	Urban Park	35%	Urban Park	51%
Percentage of Lake Mohave by zone	Primitive	0%	Primitive	2%	Primitive	2%	Primitive	0%
	Semiprimitive	0%	Semiprimitive	4%	Semiprimitive	0%	Semiprimitive	0%
	Rural Natural	17%	Rural Natural	22%	Rural Natural	15%	Rural Natural	8%
	Urban Natural	59%	Urban Natural	62%	Urban Natural	51%	Urban Natural	59%
	Urban Park	24%	Urban Park	10%	Urban Park	32%	Urban Park	33%
Facilities								
Lake boating capacities	Lake access facilities and parking would be developed to support 5,975 boats at any one time (BAOT).		Lake access facilities and parking would be developed to support 4,393 boats at any one time.		Lake access facilities and parking would be developed to support 5,055 boats at any one time.		Lake access facilities and parking would be developed to support 5,800 boats at any one time.	
Facility expansion (boating education center)	None		A boating safety center would be constructed at Boulder Beach on Lake Mead. Another boating safety center could be constructed to serve Lake Mohave.		A boating safety center would be constructed at Boulder Beach on Lake Mead. Another boating safety center could be constructed to serve Lake Mohave.		A boating safety center would be constructed at Boulder Beach on Lake Mead. Another boating safety center could be constructed to serve Lake Mohave.	
Facility expansion (launch ramp and marina)	Under the <i>General Management Plan</i> , a new major marina has been proposed at Fire Mountain and the expansion of facilities has been authorized for Cottonwood Cove on Lake Mohave and for Callville Bay and Temple Bar on Lake Mead.		No expansion of facilities would be authorized over existing capacities.		Facility expansion would be authorized at Cottonwood Cove and Eldorado Canyon on Lake Mohave and at Callville Bay, Echo Bay, Overton Beach, Stewarts Point, and Temple Bar on Lake Mead.		Facility expansion would be authorized at Cottonwood Cove and Eldorado Canyon on Lake Mohave and at Callville Bay, Echo Bay, Overton Beach, Stewarts Point, and Temple Bar on Lake Mead.	

Program Elements	Alternative A (No Action)	Alternative B	Alternative C (Modified Preferred Alternative)	Alternative D (Baseline)
Visitor Conflict				
Shoreline zoning	Shoreline zoning is in place at Boulder Beach on Lake Mead where some areas and activities have mandatory zoning and others have voluntary zoning.	Shoreline zoning would be voluntary for camping, SCUBA, fishing, sailboarding, and personal watercraft use.	Shoreline zoning in the urban park zones would be mandatory for camping, SCUBA, fishing, and slalom course activities.	Shoreline zoning would be mandatory for camping, SCUBA, fishing, sailboarding, and personal watercraft use.
Shoreline conflict	Flat-wake regulations currently exist only in designated and/or marked areas under the <i>General Management Plan</i> .	A 100-foot flat-wake area is proposed around the entire shoreline of Lakes Mead and Mohave.	A 200-foot flat-wake area is proposed around beaches frequented by bathers, boats at the shoreline, and near people in the water and at the water's edge.	A 300-foot flat-wake area is proposed around the entire shoreline of Lakes Mead and Mohave.
Personal watercraft use	Personal watercraft use would be prohibited by absence of special regulation after November 2002.	EPA-compliant personal watercraft use would be authorized in the rural natural, urban natural, and urban park zones only.	Personal watercraft use would be authorized in the rural natural, urban natural, and urban park zones only. EPA standards would be adopted by 2012.	Personal watercraft use would be authorized in all zones of Lakes Mead and Mohave.
Alcohol use	Designated high-use areas are currently alcohol-free. Current regulations for alcohol consumption would apply.	Designated high-use areas and high-use shorelines would be alcohol-free, and glass beverage containers and styrofoam would be prohibited. Current regulations for alcohol consumption would apply.	Designated high-use areas, high-use shorelines, and problem areas would be alcohol-free, if deemed to be in the best interest of the public. Alcohol consumption while operating a boat would be prohibited. Glass beverage containers and styrofoam would be prohibited.	Alcohol use, glass containers, and styrofoam would be prohibited within Lake Mead National Recreation Area.

Program Elements	Alternative A (No Action)	Alternative B	Alternative C (Modified Preferred Alternative)	Alternative D (Baseline)
Boater education	National Park Service would play only a limited role in boater education. Information systems are inadequate as to availability, coverage, targeted audience and coordination.	National Park Service would offer boater education courses targeting Lake Mead National Recreation Area boaters to increase the number of educated boaters from 20% to 40%. Information systems would be aggressive and planned and use multilevel media.	National Park Service would support the state of Nevada implementation of a mandatory boater education program and encourage Arizona to implement such a program.	National Park Service would take the lead in boater education and would require boater education for all boat operators.
Enforcement	National Park Service would play only a limited role in proactive (preventative style patrols) and would do little to coordinate other agencies' patrols as to the times, areas, or emphasis of enforcement efforts. Boating laws now vary between states and between state and federal agencies.	National Park Service would have thorough coordination with other agencies, would ensure boat patrol coverage in high-use areas and would identify areas for patrol emphasis. National Park Service would rely on other agencies for patrol and would respond mostly to emergencies. National Park Service would encourage states to pass uniform boating regulations.	National Park Service would coordinate with other agencies to augment patrol efforts with the National Park Service, filling the gaps and ensuring lakewide coverage. The National Park Service would assist in the development of uniform boating laws and education for Lakes Mead and Mohave.	National Park Service would take the lead in the patrol and enforcement function for Lakes Mead and Mohave. National Park Service, under the superintendent's authority, would make all boating regulations consistent lakewide.

Program Elements	Alternative A (No Action)	Alternative B	Alternative C (Modified Preferred Alternative)	Alternative D (Baseline)
Sanitation and Litter				
Sanitation	Under the <i>General Management Plan</i> , there are no sanitation guidelines for the public use of the backcountry shoreline. Restrooms are located in high-use sites (1 restroom per 80 boats). Boat pump-out facilities are located at the concession facilities. There is no opportunity for sanitary disposal of human wastes away from the marinas. There would be no change in sanitation management.	Restrooms would continue to be located along the shoreline in high-use areas and floating toilets would be located in high-boating areas at a density of 1 restroom per 40 boats. The public would be encouraged to use portable toilets. Public pump-out facilities would be expanded.	All overnight users on the lake would be required to have portable toilets to contain human waste. Additional boat pump-out facilities would be provided at public launch areas. Seven floating restroom / pump-out / toilet dump stations would be located on Lake Mead and three on Lake Mohave.	All boaters would be required to have portable toilets to contain human waste. Shoreline restrooms would be located at all high-use drive-in locations. Floating toilets would be placed in high-use areas at a density of 1 toilet per 150 boats. Portable toilets would be required for camping. Eight floating restroom / pump-out / toilet dump stations would be located on Lake Mead and three on Lake Mohave.
Litter	Shoreline litter is identified as one of the larger problems facing the management of the park. Litter bags are available at all marinas and launch ramps, and glass is prohibited in specific areas. National Park Service conducts and coordinates limited shoreline litter cleanup efforts. Litter management would continue as described in the <i>General Management Plan</i> .	Shoreline litter cleanup and recycling programs would be expanded. Glass and styrofoam would be prohibited in high-use areas. Litter bags would be available at launch ramps. Partnerships would be established to seek crews for shoreline cleanup.	Shoreline litter cleanup and recycling programs would be expanded. Glass beverage containers and styrofoam would be prohibited in the recreation area . Recycling bags and containers would be available at launch ramps and marinas. A National Park Service concession partnership would bring resources and attention to environmental issues.	National Park Service would take the lead in litter removal by scheduling litter patrols of heavy-use shoreline areas. All glass beverage and styrofoam containers would be prohibited in the recreation area . Litter and recycling bags would be available at the launch ramps and marinas. Partnerships would be established to seek voluntary crews to assist in shoreline cleanup.

Program Elements	Alternative A (No Action)	Alternative B	Alternative C (Modified Preferred Alternative)	Alternative D (Baseline)
Resource Protection				
Shoreline enhancements	Infrequent clearing of salt cedar takes place in selected shoreline areas. Some planting of native vegetation occurs along the shoreline. These shoreline enhancement practices would continue.	Selected shoreline areas would receive selective clearing of salt cedar and planting of native cottonwood or willow species.	Same as alternative B.	No shoreline enhancement would be likely due to increased visitation and use of lakeshore.
Inflow areas	Sensitive inflow areas are not provided with specific protection other than monitoring. Monitoring would continue, but no protection would be provided.	Sensitive inflow areas would be protected by the designation of nonmotorized use.	Sensitive inflow areas would be protected through the designation of primitive and semiprimitive zones, where motorized use would be prohibited or restricted.	Sensitive areas would not be provided additional protection and would receive additional motorized use.
Water quality	Bacterial water quality would continue to be monitored at marinas. No program currently exists to monitor chemical constituents in the waters, other than the annual testing required within the <i>Safe Drinking Water Act</i> . Personal watercraft would be banned. Continued use of all direct-injection two-stroke and four-stroke engines and carbureted two-stroke engines would be allowed.	Bacterial water quality would be monitored at high-use areas, marinas, and backcountry beaches. National Park Service would begin a chemical water monitoring program that tracks hydrocarbons and other organic compounds associated with motorized use. Within a year of the record of decision for this environmental impact statement, engines that do not meet the EPA 2006 emission standards would be prohibited.	Same as alternative B. After 2012 all engines that do not meet the EPA 2006 emission standards would be prohibited.	Same as alternative B. Continued use of all direct-injection two-stroke and four-stroke engines and carbureted two-stroke engines would be allowed.

Program Elements	Alternative A (No Action)	Alternative B	Alternative C (Modified Preferred Alternative)	Alternative D (Baseline)
Threatened, endangered, and sensitive species	Species would continue to be monitored. No conflict has been identified between the species and recreational use so no management actions have been taken.	Species would be monitored and if conflict occurs with recreation, use would be managed to remove the conflict. Certain areas might be closed to motorized uses to protect sensitive species, such as nesting birds.	Same as alternative B.	Same as alternative B.
Resource Protection				
Culturally sensitive areas	Cultural sites would continue to be monitored but not on a scheduled protocol. No impact on cultural sites from recreational use has been documented.	Cultural sites located in areas where they could receive impact from recreational use of the lakes would be monitored at a frequency that would ensure preservation. If damage was identified, sites would be evaluated and possibly closed to future recreational use.	Same as alternative B.	Same as alternative B.

Moreover, visitor use surveys identified that visitors perceive crowded conditions occurring on the waters and at the shoreline during the peak use periods. A critical point was reached when 50% of the boaters reported the quality of their visit was diminished by the number of boats on the water.

As a result of these studies, boating capacities are proposed under each alternative that correspond with the recreational setting. A range of recreational settings is described and mapped for major areas of the lakes ranging from primitive to urban park (table 2). The elements described for each setting include accessibility, the extent of the facilities, the level of boating activity, the level of administrative controls on boating activities, and the integrity of the recreational setting. Visitor use models were used to project recreational settings and calculate the boating capacities. A summary of the boating capacities for each zone under the four alternatives is shown in table 3.

Boating capacities would be managed by limiting the amount of parking at each of the lake access sites including marinas and launch ramps. A set parking capacity would be established for each area based on the lake carrying capacity. These capacities would address all types of use within the developed areas including single and pull-through parking sites. The capacities for each developed area were set in the *General Management Plan*, but revised capacities are proposed under each alternative based on new information collected in the preparation of this plan. These facility capacities, including parking spaces, would set the basis for the management of water recreation and would be monitored for effectiveness.

The method for determining the boating carrying capacity is described in appendix B (page 314). Tables 4 and 5 provide a comparison of the current launch capacities and the recommended boating carrying capacity under each alternative for Lake Mead and Lake Mohave, respectively.

Additional Compliance Requirements

Under each of the alternatives, additional analysis may be required under certain components. A summary of those components and requirements for

analysis are included in “Table 6: Construction Projects and Additional Analysis Required.”

Promulgation of a special regulation on personal watercraft use — Under all the action alternatives, Lake Mead National Recreation Area is required to promulgate a special regulation by December 31, 2002, to allow for the continued use of personal watercraft in the recreation area.

MITIGATION MEASURES AND DEVELOPMENT CONSTRAINTS

Mitigation measures and development constraints are specific actions that when implemented, minimize, avoid, or eliminate impacts on resources that would be affected by alternative actions. The National Park Service would fully comply with all applicable laws, regulations, and policies governing resource protection including the *Endangered Species Act*, *Safe Drinking Water Act*, *Clean Water Act*, *Clean Air Act*, *Flood Management Plan* (1977), *Protection of Wetlands* (1977), and *National Historic Preservation Act*, and agency-specific guidelines. In instances where resource conditions may have changed over time or more detailed site design is required, the National Park Service would ensure that the necessary level of environmental compliance has been completed prior to implementing any proposed actions.

The following resource protection strategies would be implemented under each alternative.

Facility Siting and Design/Lighting

New facilities would be located and designed to meet the architectural theme of the recreation area, minimize the visual intrusion on the landscape, and minimize impacts to the night sky.

The exact location and design of facilities would require an onsite evaluation of local soil conditions. Preferred sites would possess well-drained soils. Where feasible, locations requiring excessive cut and fill would be avoided, as would steep slopes and sites that are subject to subsidence, landslides, rock outcrops, easily eroded soils, and flood hazards.

TABLE 3: SUMMARY OF BOATING CAPACITIES FOR EACH ALTERNATIVE¹

	Alternative A (No Action)		Alternative B		Alternative C (Modified Preferred Alternative)		Alternative D (Baseline)	
Zone	Recreational Setting	BAOT	Recreational Setting	BAOT	Recreational Setting	BAOT	Recreational Setting	BAOT
Lake Mohave								
1	U	560	U	560	U	560	U	560
2	U	350	UN	260	U	350	UN	260
3	UN	325	RN	200	UN	325	U	500
4	UN	250	RN	125	UN	250	U	400
5	RN	100	RN	100	RN	100	RN	100
6	RN	48	SP	25	RN	48	UN	70
7	RN	17	SP	13	RN	17	RN	17
8	RN	95	RN	95	RN, SP, P	95	UN	125
9	RN	29	P	15	SP, RN, P	15	RN	29
Total		1,774		1,393		1,760		2,061
Lake Mead								
10	U	330	U	330	U	330	U	330
11	U	650	U	650	U	650	U	650
12	U	578	U	578	U	578	U	578
13	U	33	UN	25	UN	25	UN	25
14	UN	380	RN	75	RN	75	RN	75
15	UN	13	SP	11	RN, SP, P	11	RN	11
16	UN	130	RN	86	RN	86	UN	130
17	U	460	UN	360	U	460	U	460
18	U	603	RN	301	UN, RN, SP, P	452	U	603
19	UN	104	RN	60	RN	60	UN	104
20	U	501	UN	376	UN	376	U	501
21	U	50	RN	27	RN	27	UN	27
22	U	280	RN	100	RN	100	UN	180
23	UN	35	P	13	RN, SP	40	RN	40
24	UN	54	P	8	RN	25	RN	25
Total		4,201		3,000		3,295		3,739
Total Lake Mead National Recreation Area		5,975		4,393		5,055		5,800
<p>1. See appendix B for details.</p> <p>U = Urban UN = Urban natural</p> <p>RN = Rural natural SP = Semiprimitive</p> <p>P = Primitive BAOT = Boats at any one time</p>								

TABLE 4: SUMMARY OF LAUNCH CAPACITIES AT LAKE MEAD FOR EACH ALTERNATIVE

	Lake Mead Launch Capacity (Number of Boats per Day)			Carrying Capacity¹
	<u>Commercial²</u>	<u>Public³</u>	<u>Total⁴</u>	<u>BAOT⁵</u>
Alternative A	1,453	2,330	3,783	4,201
Alternative B	965	1,685	2,650	3,000
Alternative C	1,208	2,004	3,212	3,295
Alternative D	1,397	2,161	3,558	3,739

1. Carrying capacity reflects the recommended maximum number of boats on the water at any one time. Estimates are calculated using Graefe and Holland (1997) and are based on the proposed mix of recreational opportunity zones shown in table 2. See appendix B.

2. Assumes 20% of the boats in wet slips, 10% of the boats in dry storage, and 100% of the rental fleet are on the lake at any given time. Calculations are based on the number of authorized rental boats and slips under each alternative (see tables 9, 15, 21, and 29).

3. Estimated number of boats that could be launched in one day (see tables 11, 17, 23, and 31).

4. Total reflects the estimated maximum number of boats that could be on the lake at any one time based on the launch capacity.

5. Boats at any one time.

TABLE 5: SUMMARY OF LAUNCH CAPACITIES AT LAKE MOHAVE FOR EACH ALTERNATIVE

	Lake Mohave Launch Capacity (Number of Boats per Day)			Carrying Capacity¹
	<u>Commercial²</u>	<u>Public³</u>	<u>Total⁴</u>	<u>BAOT⁵</u>
Alternative A	642	967	1,609	1,774
Alternative B	475	947	1,422	1,393
Alternative C	524	1,147	1,671	1,760
Alternative D	574	1,494	2,068	2,061

1. Carrying capacity reflects the recommended maximum number of boats on the water at any one time. Estimates are calculated using Graefe and Holland (1997) and are based on the proposed mix of recreational opportunity zones shown in table 2. See appendix B.

2. Assumes 20% of the boats in wet slips, 10% of the boats in dry storage, and 100% of the rental fleet are on the lake at any given time. Calculations are based on the number of authorized rental boats and slips under each alternative (see tables 10, 16, 22, and 30).

3. Estimated number of boats that could be launched in one day (see tables 12, 18, 24, and 32).

4. Total reflects the estimated maximum number of boats that could be on the lake at any one time based on the launch capacity.

5. Boats at any one time.

TABLE 6: CONSTRUCTION PROJECTS AND ADDITIONAL ANALYSIS REQUIRED

Alternative A (No Action)	Alternative B	Alternative C (Modified Preferred Alternative)	Alternative D (Baseline)
	Boating Education Center at Boulder Beach Additional Analysis: Yes	Boating Education Center at Boulder Beach Additional Analysis: Yes	Boating Education Center at Boulder Beach Additional Analysis: Yes
Facility expansion at Cottonwood Cove Additional Analysis: Yes		Facility expansion at Cottonwood Cove Additional Analysis: Yes	Facility expansion at Cottonwood Cove Additional Analysis: Yes
	Addition of marina slips at Echo Bay and Callville Bay Additional Analysis: No	Addition of marina slips at Echo Bay, Overton Beach, Temple Bar, and Callville Bay Additional Analysis: No	Facility expansion at Echo Bay, Overton Beach, Temple Bar, and Callville Bay Additional Analysis: Yes
Facility expansion at Temple Bar Additional Analysis: Yes			
Facility expansion at Callville Bay Additional Analysis: Yes		Facility expansion at Callville Bay Additional Analysis: Yes	Facility expansion at Callville Bay Additional Analysis: Yes
Improved access of Stewarts Point Additional Analysis: Yes		New lake access at Stewarts Point Additional Analysis: Yes	New lake access at Stewarts Point Additional Analysis: Yes
		New lake access at Eldorado Landing Additional Analysis: Yes	New lake access at Eldorado Landing Additional Analysis: Yes
		Shoreline access road between Government Wash Road and Boxcar Road Additional Analysis: Yes	

Resource Protection

Natural Resources. Areas near construction sites would be revegetated with native species and restored to natural conditions. To the extent practical, disturbed sites would be revegetated with native plant materials (e.g., native seeds, transplanted native vegetation) salvaged from areas impacted by construction. To guide restoration efforts, the National Park Service would follow procedures outlined in the vegetation management plan including procedures for collecting and propagating native species, salvaging topsoil, site grading and soil preparation, erosion control, vegetation reestablishment, and postconstruction monitoring.

Construction activities would be scheduled to minimize impacts on wildlife behavior and habitat use. Park managers would continue to protect critical

wildlife habitat and areas central to wildlife activity from human disturbance by implementing visitor use restrictions and monitoring programs.

Threatened, Endangered, and Sensitive Species.

Native Fish — To protect native fish spawning sites on Lake Mead, the back bay of Echo Bay would be closed to motorized use during spawning season, between December 1 and May 1. The Las Vegas Bay area would remain a flat-wake zone.

On Lake Mohave, the National Park Service would continue to work with the Native Fish Work Group on monitoring native fish species. If recreational use of known spawning sites increases, or if the Native Fish Work Group recommends action, the National Park Service would close spawning sites to boating activity during spawning season.

In addition, if the use of areas around the grow-out ponds for native fish increases, temporal closures to recreational use could be imposed.

Southwestern Willow Flycatchers — A monitoring program would be implemented for the Southwestern willow flycatcher in accordance with the U.S. Fish and Wildlife Service. If breeding pairs or nesting sites are found during the surveys, the areas would be closed to restrict all recreational use, including lake access to the sites.

Desert Tortoises — Mitigation, including tortoise education requirements, and measures to minimize adverse effects to the desert tortoise, would be implemented at all construction projects.

Relict Leopard Frogs — The National Park Service is currently working with the University of Nevada (Las Vegas and Reno), the Nevada Division of Wildlife, and the Environmental Protection Agency to inventory and monitor the relict leopard frog. The Rana Onca Work Group, comprised of local, state, and federal land management, and wildlife agencies from Nevada, Arizona, and Utah, are also working on joint monitoring programs and a conservation strategy to protect the relict leopard frog. Conservation measures that are ongoing include reintroducing frogs into suitable habitat and working with area agencies to improve springs to conditions that support the relict leopard frogs, including nonnative plant removal.

Known habitat along Black Canyon would not be designated as camping sites. If future monitoring shows an expansion of the relict leopard frogs into additional springs within the Black Canyon, those areas would be protected through temporal closures to camping and other protection measures as necessary and appropriate.

Sensitive Plant Species — Surveys would be conducted prior to any construction projects and areas with rare and sensitive plants would be avoided.

Cultural Resources. To protect cultural resources and comply with the *National Historic Preservation Act*, all proposed projects would be evaluated to determine the area of potential effect. These areas would be inventoried for significant cultural resources and a determination would be made as to what impact the project would have on the historic qualities of the resources. Through consultation with project designers, affiliate tribal entities, the

respective State Historic Preservation Offices, and the Advisory Council on Historic Preservation, a plan would be developed to avoid or mitigate impacts. At present, the known areas of concern are the St. Thomas Historic District, the Temple Bar Historic District, Lost City Archeological District, Black Canyon, Willow Beach, and the Hoover Dam Historic District.

Water Quality. Chemical pollutant monitoring would be instituted in order to protect the high water quality standards for recreation. If monitoring determines that water quality standards are being violated, specific areas of the recreation area could require temporal or seasonal closures.

A monitoring plan that would include several targeted constituents of gasoline and related degradation products, including some polycyclic aromatic hydrocarbons (PAH), would be implemented at the Lake Mead National Recreation Area. The monitoring plan would focus efforts on high-use areas on Lakes Mead and Mohave. This would include the evaluation of all fueling facilities on Lakes Mead and Mohave. Specific locations might require temporal or seasonal closures if monitoring identifies areas of concern not meeting water quality standards. The development of a monitoring plan would be consistent with the interests of local, state, and federal agencies.

Air Quality. The National Park Service would employ mitigation measures to protect air quality during construction activities. Water would be applied to roadway surfaces, as necessary, to minimize the release of dust. Low-sulfur fuel (0.05% by weight) would be used when available, and construction equipment would be properly tuned. These are the standard mitigation measures required by the National Park Service on all construction projects at Lake Mead National Recreation Area.

Lake Mead National Recreation Area complies with federal and state regulations related to the *Clean Air Act* and hazardous materials. Any facility renovation within Lake Mead National Recreation Area first requires a licensed contractor to test the building components to determine if there are asbestos and lead contaminants present. If contaminants are present, contractors would be hired to remove the contaminants in accordance with state and federal standards and requirements.

Visitor Use and Experience

Whenever possible, the National Park Service would adjust its work schedules, particularly the timing of construction activities, to minimize impacts on park visitors.

Facility construction would be prioritized and phased wherever possible to minimize disruption of park operations and visitor use.

IMPLEMENTATION PRIORITIES

The purpose of this planning effort is to determine the types of management actions that would enhance resource protection and visitor experience at Lake Mead National Recreation Area without consideration of funding options. Available funding ultimately will determine when certain actions proposed under any alternative management strategy would be implemented. This document would serve as a guide for the National Park Service when pursuing funding from a variety of federal, state, and local sources.

Implementation priorities will be determined within the framework of other park planning documents,

including the *General Management Plan* (NPS 1986), the *Government Performance and Results Act of 1993*, and the *NPS Strategic Plan* (NPS 2001b). The *Strategic Plan* for Lake Mead National Recreation Area establishes long-term goals, as well as an annual work plan that describes yearly goals to be implemented with available funding. Each year the annual work plan reflects parkwide priorities, including those for implementing this lake management plan.

In the development of the *Draft Environmental Impact Statement / Lake Management Plan*, the existing level of public and commercial services was accepted as the baseline. None of the alternatives considered a reduction in launch capacities, as there was no justification to do so from a physical or social carrying capacity perspective.

Staffing needs are identified in the “Park Operations” section under each alternative description in this chapter. Lake Mead National Recreation Area would incorporate the operational needs identified in this document into the priorities submitted annually under the Operating Formulation Systems of the national park system. This administrative system is in place for each park unit to identify operational needs.

ALTERNATIVE A: NO ACTION

GENERAL CONCEPT

The no-action alternative represents the management direction under the current *Lake Mead National Recreation Area General Management Plan* (NPS 1986). Under this alternative, park managers would manage increasing use in accordance with the *General Management Plan*, affecting the ability to provide for a spectrum of recreational settings. Improvements would be made only on an as-needed basis as funding becomes available. Required improvements for safety, facilities, conflict resolution, sanitation, litter, and resource preservation would be undertaken without a coordinated strategy and funding initiative. Table 2 provides a summary of the actions proposed under this alternative, as well as the actions proposed under the other alternatives.

Under this alternative, no unit-specific rule would be developed for the continued use of personal watercraft. Therefore, after [December 31, 2002](#), in accordance with *Bluewater Network v. Robert Stanton* (No. CV02093) and the settlement agreement approved by the court on April 12, 2001, personal watercraft would be prohibited within Lake Mead National Recreation Area. All other watercraft would be permitted anywhere on the lake with the exception of existing shoreline zoning areas along Boulder Beach on Lake Mead and in areas specifically restricted by markers or buoys.

RECREATIONAL OPPORTUNITY ZONING

The range of recreational opportunities under this alternative for Lake Mead National Recreation Area is shown in tables 7 and 8 and in figure 3.

Currently, both Lakes Mead and Mohave have areas of low use that meet the semiprimitive conditions. However, these areas are not managed as semiprimitive, nor are there any restrictions currently applied to watercraft use in these areas. Under this alternative, these areas would continue to be considered semiprimitive, because the existing setting meets many of the criteria of the recreational opportunity spectrum class. However, no watercraft restrictions would be applied to these areas.

The boating levels of Lakes Mead and Mohave would be managed based on physical harbor capacities independent of other physical, environmental, and social factors that have been evaluated between 1994 and the present. These boating levels, called boats at any one time (BAOT), would be set at the boating capacity of 5,975 [as shown in table B-4](#) in appendix B (page 314), with 4,201 for Lake Mead and 1,774 for Lake Mohave. Watercraft allowed under this alternative would exclude personal watercraft. This BAOT level includes expansion authorized in the 1986 *General Management Plan*.

The lakes would be managed for rural and urban recreational settings, and primitive settings would not be offered. No written plan, other than the *General Management Plan* and the *Strategic Plan*, would be available to direct park managers in managing this recreation area.

TABLE 7: RANGE OF RECREATIONAL OPPORTUNITIES AT LAKE MEAD UNDER ALTERNATIVE A

Recreation Opportunity Spectrum Class	Surface Acres ¹	Percentage
Primitive	0	0
Semiprimitive	0	0
Rural natural	0	0
Urban natural	50,925	39
Urban park	79,372	61
Total	130,297	100

1. Based on a lake elevation of 1,180 feet above mean sea level.

TABLE 8: RANGE OF RECREATIONAL OPPORTUNITIES AT LAKE MOHAVE UNDER ALTERNATIVE A

Recreation Opportunity Spectrum Class	Surface Acres	Percentage
Primitive	0	0
Semiprimitive	0	0
Rural natural	4,570	17
Urban natural	16,159	59
Urban park	6,672	24
Total	27,401	100

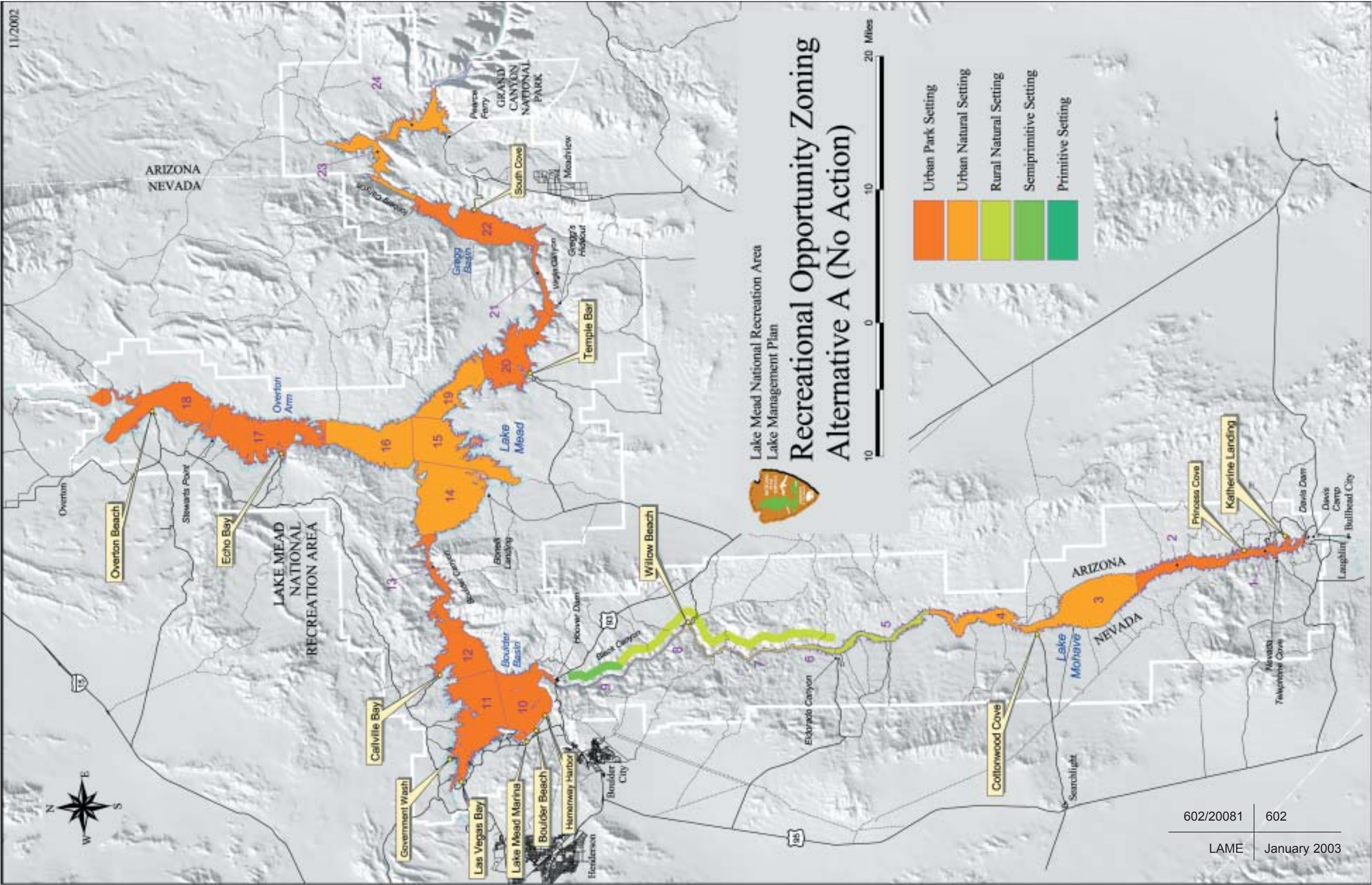


FIGURE 3: RECREATIONAL OPPORTUNITY ZONING UNDER ALTERNATIVE A (NO ACTION)

FACILITIES

Under this alternative, the *General Management Plan* would provide the basis for determining marina and boat storage capacities along with the size and composition of the rental fleet. Under the *General Management Plan*, facility expansion could be authorized at Cottonwood Cove on Lake Mohave and at Callville Bay and Temple Bar on Lake Mead. Tables 9 and 10 show the number of commercial marina services at Lake Mead and Lake Mohave, respectively. Tables 11 and 12 show the number of public launch facilities at Lake Mead and Lake Mohave, respectively. The launch capacity was calculated consistent with other public launch ramps, where they either function as side launch ramps or straight launch ramps, but not both. Therefore, the launch capacity is based on the number of launch lanes at eight minutes per launch/retrieval operation (consistent with other public launch ramps). The parking calculations are based on aerial photographs showing the facility at capacity operation at an approximate lake elevation of 1,180 feet above mean sea level. Some facilities would be authorized to expand beyond the boating capacity calculated in appendix B (page 314).

The *General Management Plan* calls for the construction of a new marina at Fire Mountain on Lake Mohave. It is recognized that with the isolation of this potential development area, it is difficult to justify the level of funding necessary for this development. In addition, subsequent to the *General Management Plan*, the area was designated as critical habitat for the desert tortoise. Therefore, the likelihood of this site being developed is remote, and this facility is being eliminated from further consideration. No additional new facilities are proposed in the *General Management Plan*. However, existing public facilities would be upgraded, by replacing asphalt launch ramps with concrete and improving restroom facilities along the shoreline.

VISITOR CONFLICT

Under the existing management, visitor conflict is occurring between boating groups, between boaters and nonboaters, and between separate nonboating users.

Shoreline Zoning

Under this alternative, shoreline zoning would continue as outlined in the *General Management Plan*, except where noted.

Areas along Boulder Beach on Lake Mead and Katherine Landing on Lake Mohave would continue as voluntary zoning areas in an attempt to manage conflict between user groups. No active enforcement is associated with voluntary zoning. Recommended activities would include fishing, SCUBA, and sailing (figures 4 and 5). Existing personal-watercraft use areas would be rezoned for other shoreline activities.

Fishing piers and earthen dikes have been constructed in the Boulder Beach area to support fishing activities where fishing is the primary activity. These are designated fishing areas. Motorized vessels are prohibited from entering these designated fishing areas. Earthen breakwaters have been constructed at Echo Bay and at the Southern Nevada Water System Treatment Facility. These areas, while used as fishing areas, are not considered exclusive use fishing areas.

Two SCUBA areas have been established under the *General Management Plan*, including the dive park south of the Pyramid Island Causeway and an area at the Big and Middle Boulder Islands. These areas are closed to boating, except in support of the SCUBA operations, and are closed to fishing.

Water recreational activities from the shoreline would continue to be authorized at all locations except as specifically prohibited with signs and/or buoys.

The sailing beach would continue to be managed to support sailboard and sailboat use.

The area between Kingman Wash and Government Wash on Lake Mead is designated a day-use area only, with camping permitted in the developed campsites only. Vehicle shoreline camping would continue to be permitted at Kingman Wash, Lower and Upper Government Wash, at the end of 8.0 Mile Road, Crawdad Cove, and Boxcar Cove (figure 4).

In the Katherine Landing area, day-use areas that allow a variety of recreational activities have been established at Arizona Telephone Cove North, Cabinsite Point, Gasoline Alley, Princess Cove, and Nevada Telephone Cove (figure 5). Vehicle shoreline

TABLE 9: COMMERCIAL MARINA SERVICES AT LAKE MEAD UNDER ALTERNATIVE A

	Overton Beach	Echo Bay	Callville Bay	Las Vegas Boat Harbor	Lake Mead Resort	Temple Bar	Total
Rentals							
Houseboats							
Authorized ¹	0	90	75	0	0	45	210
Existing ²	0	72	65	0	0	0	137
Personal watercraft							
Authorized ³	0	0	0	0	0	0	0
Existing	12	8	20	18	10	4	72
Other boats							
Authorized	12	25	33	70	70	60	270
Existing	7	23	26	47	31	13	147
Wet Storage							
Wet slips							
Authorized	140	530	1,045	635	875	980	4,205
Existing	140	360	647	635	755	95	2,632
Mooring buoys							
Authorized ⁴	0	0	0	0	0	0	0
Existing	0	19	0	0	0	5	24
Dry Storage							
Dry storage spaces							
Authorized	80	200	167	388	300	300	1,435
Existing	0	60	120	388	55	200	823
Parking							
Single spaces							
Authorized	830	750	1,000	1,125	600	835	5,140
Existing	181	217	337	285	145	125	1,290
1. Existing number plus the proposed expansion under alternative A. 2. Existing as of September 6, 2001. 3. After November 4, 2002. 4. Mooring buoys would be phased out after implementation of the proposed expansion under alternative A.							

TABLE 10: COMMERCIAL MARINA SERVICES AT LAKE MOHAVE UNDER ALTERNATIVE A

	Cottonwood Cove	Willow Beach	Katherine Landing	Total
Rentals				
Houseboats				
Authorized ¹	25	0	75	100
Existing ²	22	0	44	66
Personal watercraft				
Authorized ³	0	0	0	0
Existing	12	0	16	28
Other boats				
Authorized	31	40	49	120
Existing	20	18	49	87
Wet Storage				
Wet slips				
Authorized	535	125	824	1,484
Existing	234	0	824	1,058
Mooring buoys				
Authorized ⁴	0	0	0	0
Existing	27	0	0	27
Dry Storage				
Dry storage spaces				
Authorized	469	0	420	889
Existing	300	0	150	450
Parking				
Single spaces				
Authorized	484	155	750	1,389
Existing	153	50	325	528
<p>1. Existing number plus the proposed expansion under alternative A.</p> <p>2. Existing as of September 6, 2001.</p> <p>3. After November 4, 2002.</p> <p>4. Mooring buoys would be phased out after implementation of the proposed expansion under alternative A.</p>				

LAKE MEAD NATIONAL RECREATION AREA

LAKE MEAD NATIONAL RECREATION AREA

TABLE 12: PUBLIC LAUNCH FACILITIES AT LAKE MOHAVE UNDER ALTERNATIVE A

	Eldorado Canyon	Cottonwood Cove	Willow Beach	Princess Cove	North Telephone Cove	Katherine Landing
Launch lanes						
Authorized ¹	0	15	8	8	2	8
Existing	0	15	8	8	2 (gravel)	8
Launch lane capacity ²	0	720	384	384	86	384
Pull-through parking ³						
Authorized	0	242	155	100	100	418
Existing	0	222	155	100	100	418
Courtesy dock	No	Yes	Yes	Yes	No	Yes
Fish cleaning station	No	Yes	Yes	No	Yes	Yes
<p>1. Existing number plus the proposed expansion under alternative A.</p> <p>2. Based on the number of 12-foot launch lanes multiplied by 8 (number of launches per hour) times 12 (number of daylight hours) divided by 2 (half are launches and half are retrievals).</p> <p>3. Double parking space for vehicle with trailer.</p>						

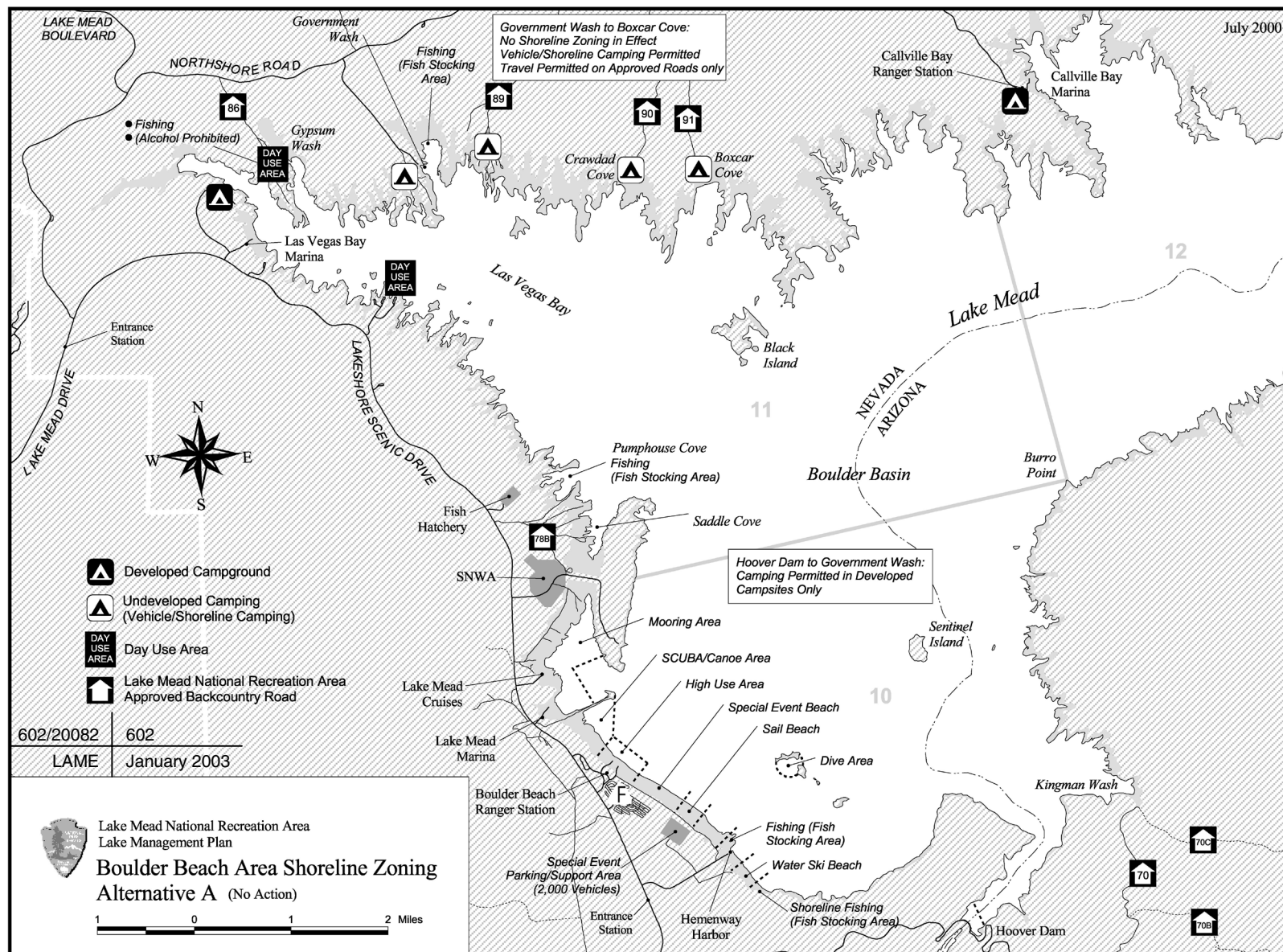


FIGURE 4: BOULDER BEACH ZONING UNDER ALTERNATIVE A (NO ACTION)

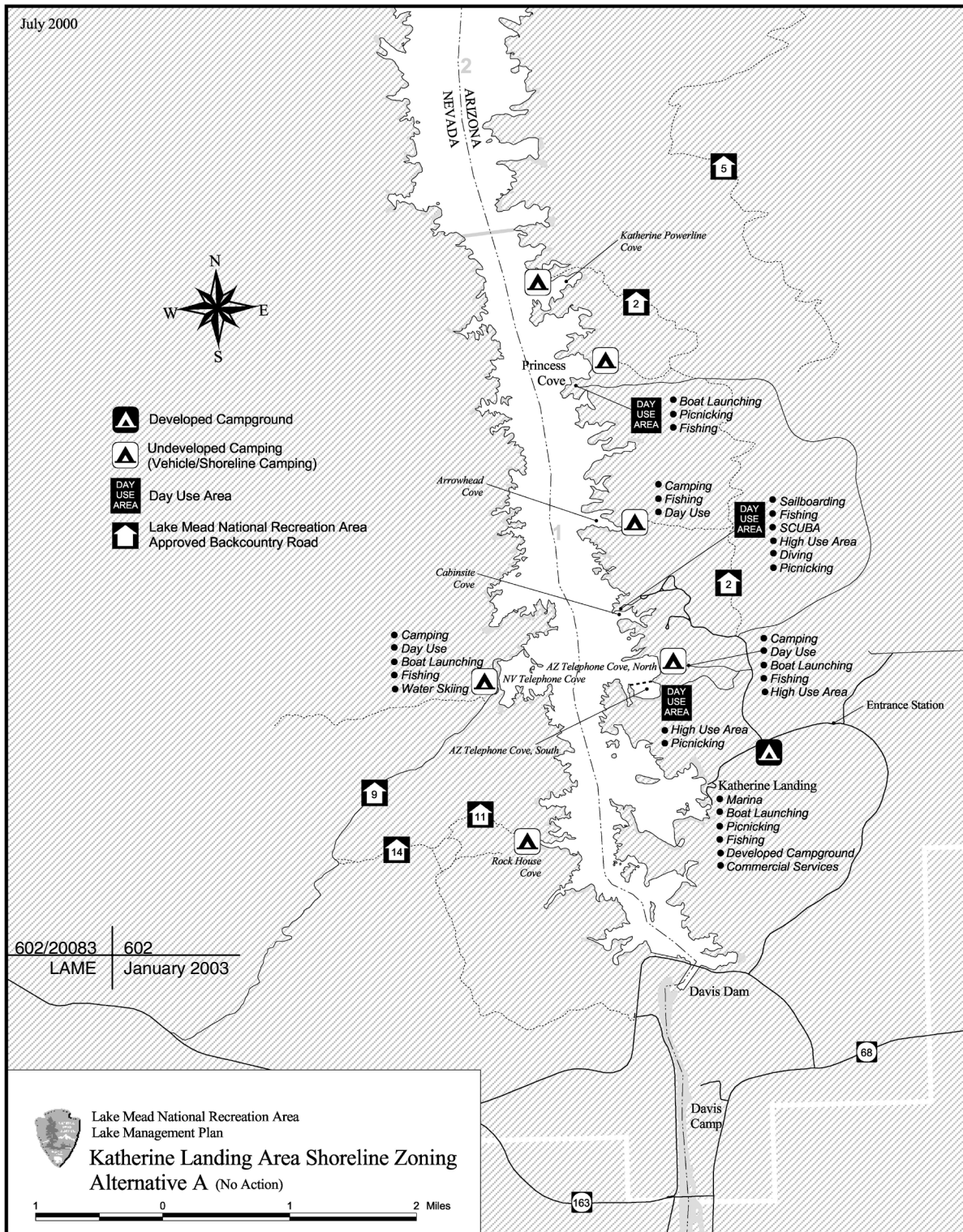


FIGURE 5: KATHERINE LANDING ZONING UNDER ALTERNATIVE A (NO ACTION)

camping areas are located at Arizona Telephone Cove North, Arrowhead Cove, Princess Cove (approved road 2C), Nevada Telephone Cove, and Rock House Cove. Fishing is authorized except where specifically prohibited in the marina and in areas where there is concentrated recreational use from the shoreline. Waterskiing and wakeboarding are authorized except where specifically prohibited by buoys or markers. These activities would continue under this alternative.

Under this alternative, both nonmotorized and motorized users would continue to utilize the Black Canyon area of Lake Mohave, from Willow Beach to Hoover Dam.

Nonmotorized launches from below Hoover Dam would be limited to 30 per day. No permits would be required for overnight camping in the area.

Enforcement, Boater Education, and Alcohol Use

[Flat-wake](#) areas are currently designated or marked by buoys. No additional [flat-wake](#) regulations would be established. Under this alternative, no steps would be taken to unify the federal and state boating laws. Boater education requirements for operating a motorized vessel on Lakes Mead and Mohave would be based on state regulations.

Alcohol would continue to be prohibited at Upper Gypsum Wash on Lake Mead. Current regulations for alcohol consumption while operating a boat would remain in place (see [“Appendix E: Comparison of Boating Regulations”](#)).

Under this alternative, the National Park Service would enforce existing noise regulations for the states of Nevada and Arizona.

Personal Watercraft Use, Waterskiing, and Wakeboarding

Personal watercraft use, waterskiing, and wakeboarding are currently authorized in all areas, except where specifically prohibited, including specific high-use shoreline areas and the SCUBA areas. Under this alternative, no unit-specific rule would be developed for the continued use of personal watercraft. Therefore, after [December 31, 2002](#), in accordance with *Bluewater Network v. Robert Stanton* (No. CV02093) and the settlement agreement

approved by the court on April 12, 2001, personal watercraft would be prohibited within Lake Mead National Recreation Area.

Certain areas of Lake Mead National Recreation Area are restricted for waterskiing and wakeboarding due to safety concerns. These areas include Chalk Cliffs north to Hoover Dam as well as the narrow passes around Katherine Landing on Lake Mohave and, on Lake Mead, the Narrows through Boulder Canyon and Black Canyon from Promontory Point to Hoover Dam.

Aircraft Landings

Aircraft landings would continue to be unrestricted on the waters of Lakes Mead and Mohave.

SANITATION AND LITTER

Under this alternative, only limited effort would be directed to address the existing sanitation and litter issues. Sanitation would continue to be addressed by the operation and maintenance of 84 backcountry toilets for both lakes, which serves an area of approximately 160,000 acres of water and over 850 miles of shoreline. No new education programs are identified in the *General Management Plan* and none would be developed to inform the public of the importance of minimum impact camping and the proper sanitation practices.

Shoreline litter would continue to be a problem for the entire recreation area. Limited initiatives would be used to remove litter from popular recreation sites. No new recycling programs would be introduced to reduce the volume of solid waste. Glass containers would continue to be permitted, except at high-use swim areas, where they are currently prohibited. No new partnerships would be established for the removal of litter, and litter would remain a source of public criticism in the future.

RESOURCE PROTECTION

Resource protection of the waters and the shoreline of Lakes Mead and Mohave would continue at current levels in accordance with the 1999 *Lake Mead National Recreation Area Resource Management Plan* (NPS 1999c).

Inflow Areas

No additional protection would be established for the sensitive inflow areas of Lake Mead, including the Pearce Ferry Delta at the mouth of the Grand Canyon and the tributaries of the Muddy and Virgin Rivers on the Overton Arm.

Shoreline Enhancement

Selected shoreline areas are receiving periodic clearing of salt cedar; however, under the *General Management Plan*, there is no priority scheduled removal of salt cedar on the shoreline areas of either Lakes Mead or Mohave.

Water Quality

The park's mandate is to preserve the existing outstanding water quality of Lakes Mead and Mohave. No additional regulations would be developed to protect water resources. State water quality standards are in place, and limited annual monitoring is conducted to ensure these standards are met to protect the recreational resource, the wildlife, and fish species. This monitoring is mainly associated with the Las Vegas Wash inflow area, at the intake facilities at the Southern Nevada Water Authority, and at selected high-use coves on Lake Mead. Studies would also continue at the Virgin River inflow area and at various areas of the lake where water clarity is being monitored.

The National Park Service will evaluate the operation of all facilities on Lakes Mead and Mohave in accordance with the modified settlement agreement.

Under this alternative, EPA regulations would dictate the use of two-stroke engines. Current EPA regulations require that industries manufacturing and selling carbureted two-stroke engines only produce and sell the fuel-efficient models beginning in 2006. Over time, this regulation will change the types of watercraft on the lakes. The first models were available for sale in 1998. Based on a possible 10-year life of a typical two-stroke engine, the full effect of the regulation would not be realized until after the year 2025.

Threatened, Endangered, and Sensitive Species

Under the *General Management Plan*, monitoring and enhancement programs are underway for threatened and endangered fish species, which occur in both Lakes Mead and Mohave. Recreational impacts on these species would continue to be monitored under this alternative. Critical habitat for the razorback sucker (*Xyrauchen texanus*) and the bonytail chub (*Gila elegans*) have been identified in Lake Mohave, and critical habitat for the razorback sucker has been identified in Lake Mead. Under this alternative, if impacts from recreational use are identified in the future, special zoning might be used to close areas to recreational use and provide a higher level of protection for this habitat during critical periods in their life cycle.

The four sensitive plant species that occur along the shorelines of Lake Mead would continue to be monitored; those plants are sticky buckwheat (*Eriogonum viscidulum*), three-sided milkvetch (*Astragalus geyeri* var. *triquetrus*), Las Vegas bearpoppy (*Arctomecon californica*), and sticky ringstem (*Anulocaulis leiosolenus*). Smoke tree (*Psoralea arguta*) and *Trixis californica* (no common name) would be monitored along Lake Mohave shorelines. Bird nesting would continue to be monitored in the inflow habitat. Under this alternative, no additional management actions related to recreation management would be developed to protect these species.

Cultural Resources

Both prehistoric and historic resources are known to occur along the shoreline of Lakes Mead and Mohave. These resources have been documented in the developed areas and in a small number of other areas around the lakes. A system to monitor the sites along the shoreline is being developed. The monitoring would continue under this alternative.

A number of submerged prehistoric and historic resources have been documented under Lakes Mead and Mohave. These resources would be preserved in compliance with NPS *Management Policies* and objectives.

To protect cultural resources and to comply with the *National Historic Preservation Act*, all proposed projects would be evaluated to determine the area of potential effect. These areas would be inventoried for

significant cultural resources, and a determination would be made as to what impact the project would have on the historic qualities of the resources. Through consultation with project designers, affiliate tribal entities, the respective State Historic Preservation Offices, and the Advisory Council on Historic Preservation, a plan would be developed to avoid or mitigate impacts.

PARK OPERATIONS

The 1999 *Lake Mead National Recreation Area Business Plan* (NPS 1999a), interviews with recreation area management staff, and personnel audits conducted at Lake Mead National Recreation Area were used to evaluate the operations at Lake Mead National Recreation Area. Law enforcement patrols would continue at their existing levels, 40 positions below the level evaluated as necessary to achieve effective law enforcement coverage of the recreation area. There are 70 maintenance positions in the recreation area, performing a variety of services including, but not limited to, facilities and

campground upkeep, road and trail maintenance and repair, sanitation services, litter removal, and water plant operation. No increase in maintenance staff would occur, leaving the staff at 50% below what is needed to address the existing responsibilities, causing an increased workload for employees and decreased ability to perform maintenance services.

Currently, 13 full-time personnel are working to manage the natural and cultural resources in the recreation area. No increase in resource staff would occur under this alternative. To effectively manage the resources within the recreation area, 16 more full-time positions would be necessary. No increase in interpretive staff would occur under this alternative. The current staff level of interpretive rangers is 13, which is deficient by 14 full-time positions and 1 part-time position.

Under this alternative, the number of personnel in law enforcement, maintenance, natural and cultural resource management, and interpretive positions would remain at the present level, 105 positions below the number necessary to effectively manage the recreation area.

ALTERNATIVE B

GENERAL CONCEPT

This alternative would provide for the most primitive recreational opportunities for visitors while protecting sensitive natural and cultural resources. Compared with other alternatives, greater limitations would be placed on motorized water recreation. All carbureted two-stroke engines, including personal watercraft, would be banned from the recreation area within a year of finalizing this plan. The development of new facilities would be limited compared to the other alternatives, and some uses would be reduced or eliminated from some areas. The restoration of natural shoreline areas that have been degraded through overuse is emphasized. Table 2 provides a summary of the actions proposed under this alternative, as well as the actions proposed under the other alternatives.

RECREATIONAL OPPORTUNITY ZONING

Under this alternative, Lake Mead National Recreation Area would be managed with the range of recreational opportunities shown in tables 13 and 14 and in figure 6.

Under this alternative, the area included in the primitive or semiprimitive recreational opportunity spectrum classification would be maximized by recognizing the areas of the lakes that receive low visitation and managing them for low use in the future. There would continue to be areas managed across the recreational opportunity spectrum, with no reductions in use necessary to implement this alternative. The recreational opportunity zoning under this alternative for Lakes Mead and Mohave is shown in figure 6.

The primitive areas for Lake Mead would be located in zones 23 and 24, extending from Iceberg Canyon to the boundary with Grand Canyon National Park, in zone 15, including Bonelli Bay, and the Gypsum Beds and the upper portion of the Virgin River tributary in zone 18. On Lake Mohave, the Black Canyon of zones 8 (partial) and 9 would be established as primitive. A semiprimitive zone would be established in zone 7 on Lake Mohave that would place boating restrictions on those vessels traveling upstream from Cottonwood Cove and downstream

from Willow Beach. Primitive and semiprimitive area designations would compose 10% of the lake and shoreline area.

The urban park classification would remain the same as alternative A with designations in the Katherine Landing area of Lake Mohave (zones 1 and 2) and in the Boulder Basin area of Lake Mead (zones 10, 11, and 12). The recreational opportunity spectrum classification with the most shoreline and area of water is the rural natural classification, encompassing 45.5%.

The boating capacity, established in appendix B (page 314), would be set at 4,393, including 3,000 for Lake Mead and 1,393 for Lake Mohave.

TABLE 13: RANGE OF RECREATIONAL OPPORTUNITIES AT LAKE MEAD UNDER ALTERNATIVE B

Recreation Opportunity Spectrum Class	Surface Acres ¹	Percentage
Primitive	14,230	11
Semiprimitive	0	0
Rural natural	59,409	45.5
Urban natural	24,225	18.5
Urban park	32,434	25
Total	130,298	100

1. Based on a lake elevation of 1,180 feet above mean sea level.

TABLE 14: RANGE OF RECREATIONAL OPPORTUNITIES AT LAKE MOHAVE UNDER ALTERNATIVE B

Recreation Opportunity Spectrum Class	Surface Acres	Percentage
Primitive	595	2
Semiprimitive	1,153	4
Rural natural	6,144	22
Urban natural	16,928	62
Urban park	2,580	10
Total	27,400	100

FACILITIES

A boating education facility would be developed within the recreation area in the Boulder Beach area. There is the potential for an additional boating education facility to serve Lake Mohave and the southern portion of the recreation area. This center would likely be constructed outside the park boundary. An expansion consisting of 200 marina slips for Callville Bay and 180 marina slips for Echo Bay would be authorized, which is less than the number outlined in the *General Management Plan*. The number of commercial marina services at Lake Mead and Lake Mohave are shown in tables 15 and 16, respectively. All other public and commercial facilities would be capped at the existing development levels. Each of the development areas would be improved to define parking for public and commercial uses that would serve as the key management action. Parking capacity would include both single and pull-through spaces necessary to implement the proposed carrying capacity, serve the needs of the development area, and provide a range of recreational settings and opportunities. Tables 17 and 18 show the number of public launch facilities at Lake Mead and Lake Mohave, respectively.

Recreational fishing programs are actively managed for both Lakes Mead and Mohave. Fish stocking programs are in place for both reservoirs, and shoreline fishing facilities have been constructed at Katherine Landing on Lake Mohave and at Hemenway Point and the causeway to Pyramid Island on Lake Mead. Earthen causeways have been constructed at Echo Bay and at the Southern Nevada Water Authority area to provide additional fishing areas. Additional facilities are proposed under this alternative for Cottonwood Cove and Willow Beach on Lake Mohave and at Government Wash and Echo Bay on Lake Mead. These, while not exclusively designed for fishing, provide an area for shoreline fishing. At these locations, habitat enhancement studies would be conducted and facilities would be built to increase the underwater structural habitat that might hold the fish in the stocking areas. Additional shoreline fishing access areas may be developed in or adjacent to existing developed areas in cooperation with the Nevada Division of Wildlife and the Arizona Game and Fish Department.

Minor facilities, such as parking areas, might be established in areas previously disturbed to support shoreline zoning.

VISITOR CONFLICT

Under this alternative, 10% of the shoreline and waters of Lakes Mead and Mohave would be designated primitive or semiprimitive. The recreational opportunity zoning would establish a boating carrying capacity for both lakes. This could reduce the use and corresponding conflict in some areas during peak use periods. The use levels would be capped.

Shoreline Zoning

Shoreline zoning in the Boulder Beach area on Lake Mead and the Katherine Landing area on Lake Mohave would continue to be managed as a voluntary program, as in alternative A, with only recommendations for activities occurring in certain areas (figures 7 and 8). Limited enforcement is associated with voluntary zoning. Recommended activities would include fishing, SCUBA, and sailing. Under this alternative, Nevada Telephone Cove and Kingman Wash in Arizona, and Eldorado Canyon, Boxcar Cove, Crawdad Cove, and [at the end of 8.0 Mile Road](#) in Nevada would be day-use areas only and would be closed to overnight camping. Government Wash would have camping under a permit system. The shoreline in these areas would be zoned to reduce conflict, including the creation of a [flat-wake](#) zone within 100 feet of the shore. Access would be primitive using the existing approved roads.

Black Canyon, located between Hoover Dam and Willow Beach on the northern end of Lake Mohave, is a cold-water area with the water temperature at 54°F year-round. The water temperature, narrow canyon environment, river current, and extremely shallow waters at the upper reaches make it a unique place within the recreation area. There are several hot springs located in Black Canyon, including Arizona Hot Springs, the primary camping area in the canyon. These characteristics attract nonmotorized boaters to Black Canyon, the only area of the recreation area where nonmotorized use occurs in significant numbers. The demand for additional nonmotorized launches over the allowed 30 launches per day has created a six-month waiting list for launch permits.

The Lake Mead National Recreation Area carrying capacity study incorporates the environmental and social conditions that characterize boating conditions on the majority of Lakes Mead and Mohave

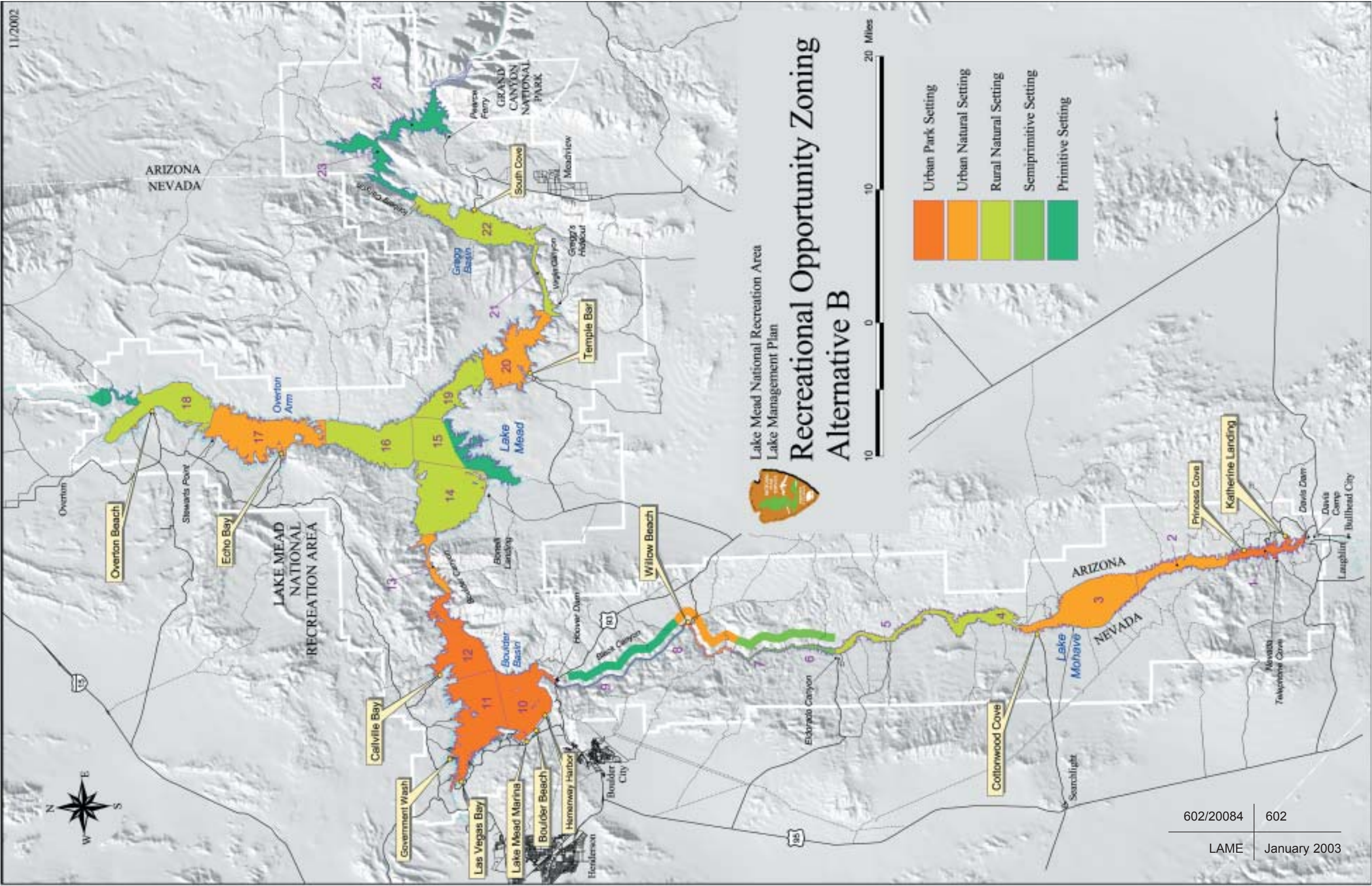


FIGURE 6: RECREATIONAL OPPORTUNITY ZONING UNDER ALTERNATIVE B

TABLE 15: COMMERCIAL MARINA SERVICES AT LAKE MEAD UNDER ALTERNATIVE B

	Overton Beach	Echo Bay	Callville Bay	Las Vegas Boat Harbor	Lake Mead Resort	Temple Bar	Total
Rentals							
Houseboats							
Authorized ¹	0	72	75	0	0	0	147
Existing ²	0	72	65	0	0	0	137
Personal watercraft							
Authorized	8	8	20	18	10	4	68
Existing	12	8	20	18	10	4	72
Other boats							
Authorized	12	23	26	47	31	13	152
Existing	7	23	26	47	31	13	147
Wet Storage							
Wet slips							
Authorized	140	560	847	635	755	95	3,032
Existing	140	360	647	635	755	95	2,632
Mooring buoys							
Authorized ³	0	0	0	0	0	0	0
Existing	0	19	0	0	0	5	24
Dry Storage							
Dry storage spaces							
Authorized	80	60	120	388	55	200	903
Existing	0	60	120	388	55	200	823
Parking							
Single spaces							
Authorized	181	217	337	285	145	125	1,290
Existing	181	217	337	285	145	125	1,290
1. Existing number plus the proposed expansion under alternative B. 2. Existing as of September 6, 2001. 3. Mooring buoys would be phased out after implementation of the proposed expansion under alternative B.							

TABLE 16: COMMERCIAL MARINA SERVICES AT LAKE MOHAVE UNDER ALTERNATIVE B

	Cottonwood Cove	Willow Beach	Katherine Landing	Total
Rentals				
Houseboats				
Authorized ¹	22	0	44	66
Existing ²	22	0	44	66
Personal watercraft				
Authorized	20	0	20	40
Existing	12	0	16	28
Other boats				
Authorized	20	18	49	87
Existing	20	18	49	87
Wet Storage				
Wet slips				
Authorized	234	125	824	1,183
Existing	234	0	824	1,058
Mooring buoys				
Authorized ³	0	0	0	0
Existing	27	0	0	27
Dry Storage				
Dry storage spaces				
Authorized	300	0	150	450
Existing	300	0	150	450
Parking				
Single spaces				
Authorized	153	200	325	678
Existing	153	200	325	678
1. Existing number plus the proposed expansion under alternative B. 2. Existing as of September 21, 2001. 3. Mooring buoys would be phased out after implementation of the proposed expansion under alternative B.				

TABLE 17: PUBLIC LAUNCH FACILITIES AT LAKE MEAD UNDER ALTERNATIVE B

	Overton Beach	Stewarts Point	Echo Bay	Callville Bay	Government Wash ¹	Las Vegas Bay	Lake Mead Resort	Hemenway Wash	Temple Bar	South Cove	Pearce Ferry ¹
Launch lanes											
Authorized ²	4	0	6	13	0	4	4	4	6	8	0
Existing	4	0	6	13	8	4	4	4	6	8	0
Launch lane capacity ³	192	0	288	576	384	192	192	192	288	384	96
Pull-through parking ⁴											
Authorized	200	0	173	333	150	222	85	175	219	116	50
Existing	200	0	173	333	150	222	85	175	219	116	50
Courtesy dock	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fish-cleaning station	Yes	No	Yes	Yes	No	Yes ⁵	No	Yes	Yes	No	No
Notes:											
1. Pearce Ferry and Government Wash are closed due to low-water conditions when lake elevations are at 1,175 feet above mean sea level or below.											
2. Existing number plus the proposed expansion under alternative B. The number of launch lanes at the facilities may be affected due to low-water conditions.											
3. Based on the number of 12-foot launch lanes multiplied by 8 (number of launches per hour) times 12 (number of daylight hours) divided by 2 (half are launches and half are retrievals).											
4. Double parking space for vehicle with trailer.											
5. There are two fish-cleaning stations at Las Vegas Bay.											

TABLE 18: PUBLIC LAUNCH FACILITIES AT LAKE MOHAVE UNDER ALTERNATIVE B

	Eldorado Canyon	Cottonwood Cove	Willow Beach	Princess Cove	North Telephone Cove	Katherine Landing
Launch lanes						
Authorized ¹	0	15	8	0	2	8
Existing	0	15	8	8	2 (gravel)	8
Launch lane capacity ²	0	720	384	384	86	384
Pull-through parking ³						
Authorized	0	222	155	100	100	418
Existing	0	222	155	100	100	418
Courtesy dock	No	Yes	Yes	Yes	No	Yes
Fish cleaning station	No	Yes	Yes	No	No	Yes
<p>1. Existing number plus the proposed expansion under alternative B.</p> <p>2. Based on the number of 12-foot launch lanes multiplied by 8 (number of launches per hour) times 12 (number of daylight hours) divided by 2 (half are launches and half are retrievals).</p> <p>3. Double parking space for vehicle with trailer.</p>						

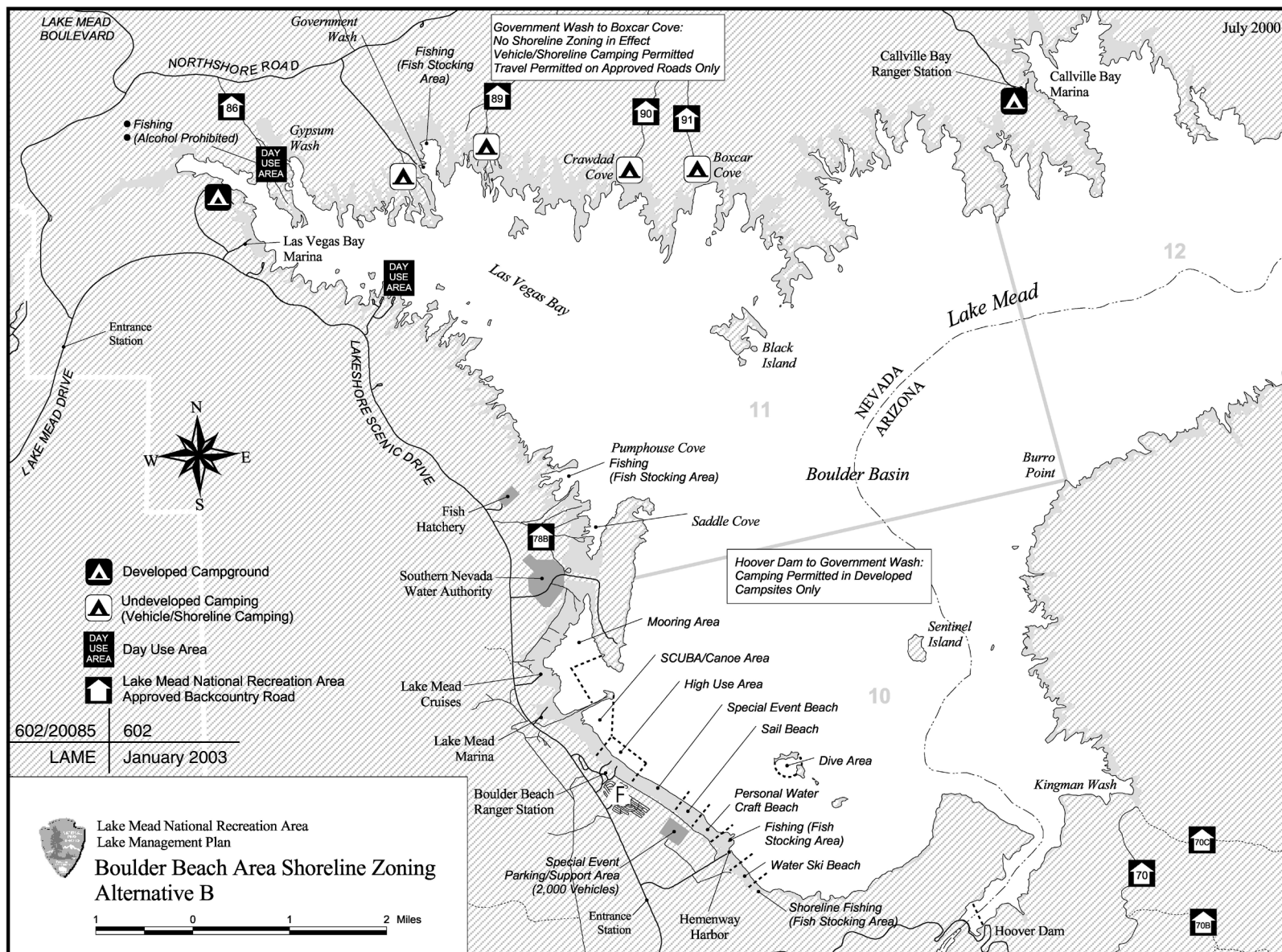


FIGURE 7: BOULDER BEACH ZONING UNDER ALTERNATIVE B

Alternative B

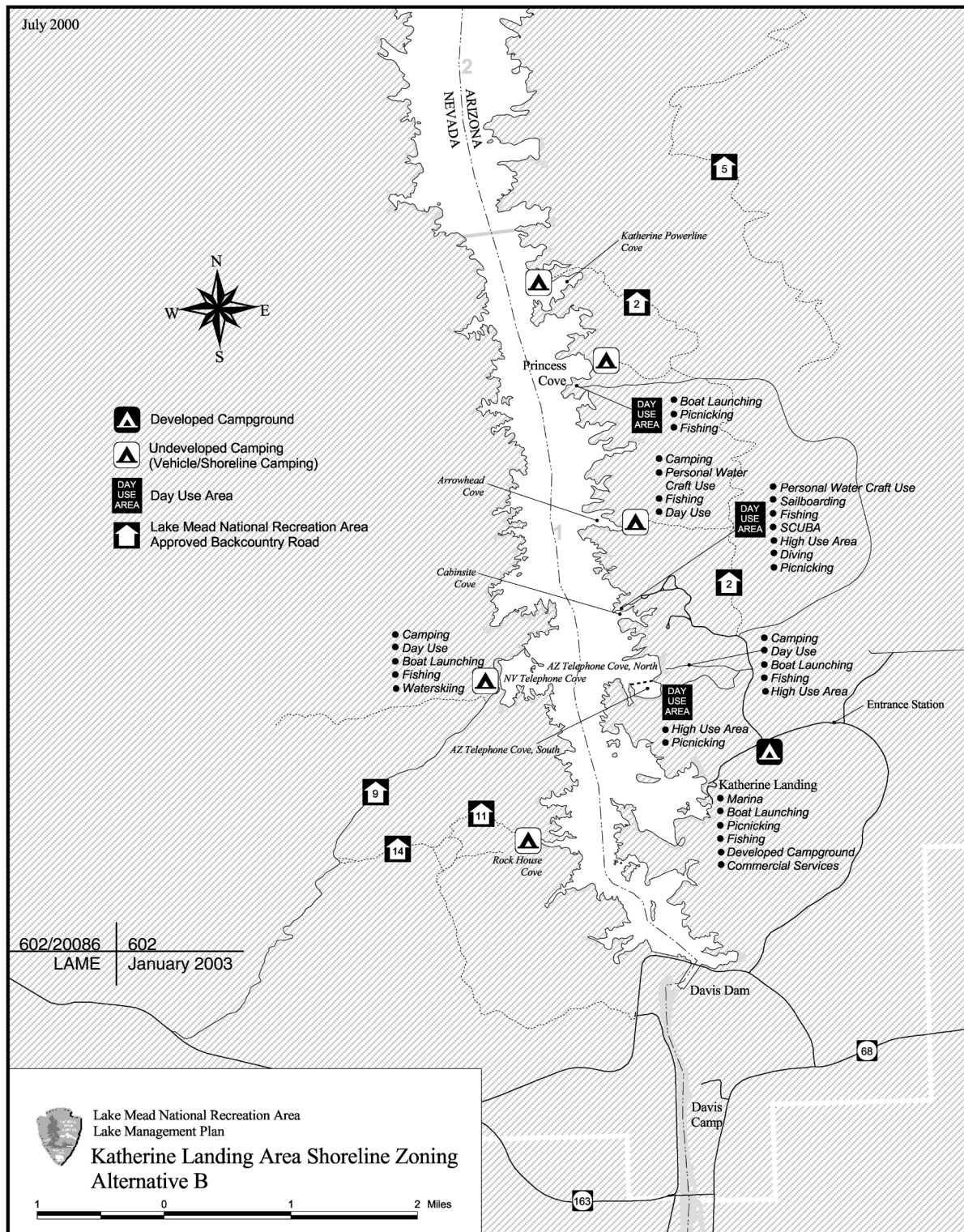


FIGURE 8: KATHERINE LANDING ZONING UNDER ALTERNATIVE B

(appendix B [page 314]). However, Black Canyon, for the reasons presented above, is more closely aligned to conditions found along the Colorado River in Grand Canyon National Park, where boating capacities are based on parties with the typical party represented by multiple boats. Under this alternative, the National Park Service proposes to manage boating within the Black Canyon by parties, rather than by individual boats. Using parties as the use indicator, Black Canyon would be managed for 20 to 26 parties per day, with 3 to 4 nonmotorized boats per party.

On Lake Mohave under this alternative, Black Canyon, from Willow Beach to Hoover Dam, would be designated as a primitive use area only and restricted to nonmotorized use on a year-round basis. Motorized concessioner raft trips would continue. The maximum number of permits for nonmotorized launches per day would be 80 boats.

Permits for camping, both for hikers and for nonmotorized users, would be limited to 30 per night, which is the equivalent of the two-persons per permit used for other hikers and backcountry users. Permits would be available through a reservation system.

Enforcement, Boater Education, and Alcohol Use

To address the boater/shoreline user conflict, the allowed speed for boaters within 100 feet of the shoreline of Lakes Mead and Mohave would be reduced to flat-wake speed. This is to prevent boater/swimmer conflicts and to respond to possible impacts associated with higher speeds close to the shore and in confined coves.

Enforcement of shoreline zoning and boating safety would be accomplished through the National Park Service and other agency patrols. The National Park Service would ensure patrol coverage of high-use areas.

Boating education is a voluntary program in Arizona and a mandatory program for boaters on interstate waters in the state of Nevada. Visitor surveys show that only 20% of boaters on Lakes Mead and Mohave have taken a basic seamanship or boating class. Under this alternative, boater education would be mandatory to operate a motorized vessel, including boats and personal watercraft, within Lake Mead National Recreation Area. A long-term program to phase in boater education is proposed; it would be

similar to programs in place in other states. For Lake Mead National Recreation Area, it is proposed that all boaters born after January 1983 would be required to take a boating class and carry a certification of this class at all times when operating a boat. The boating course would meet the requirements of the National Association of Boating Law Administrators and would satisfy the requirements for most states administering boating education programs. The National Park Service would work with the state of Arizona to establish such a program. The goal of this program is to increase the number of boaters who have taken a boating safety course from 20% to 40% over a 10-year period.

Alcohol use while boating was also raised as an issue the public would like the National Park Service to address. Under this alternative, alcohol use would be prohibited within designated high-use areas and areas identified as focus areas for patrol functions.

Under this alternative, the National Park Service would enforce existing noise regulations for the states of Nevada and Arizona.

Personal Watercraft Use, Waterskiing, and Wakeboarding

A unit-specific rule would be developed for the continued use of personal watercraft within the recreation area. All carbureted two-stroke engines would be prohibited from the recreation area within a year of the final plan. Waterskiing, wakeboarding, and the use of personal watercraft would be prohibited in the primitive and semiprimitive zones and in areas where it is currently prohibited for safety reasons, as identified in alternative A. These areas compose approximately 10% of the water portion of the recreation area. On Lake Mead, the semiprimitive and primitive areas include the inflow areas of the Muddy and Virgin Rivers on the Overton Arm, the Colorado River Delta from Iceberg Canyon to the boundary of Grand Canyon National Park, and the Gypsum Bed areas near Temple Bar; on Lake Mohave the semiprimitive and primitive areas include the area north of Eldorado Landing to Hoover Dam. Waterskiing, wakeboarding, and personal watercraft activities would be authorized in the remaining 90% of the waters zoned rural natural, urban natural, and urban park, except where specifically prohibited by markers or buoys.

Aircraft Landings

Except in emergency situations, aircraft landings would only be permitted in rural natural, urban natural, and urban park designated areas. Aircraft would not be permitted to land on the waters designated as semiprimitive or primitive including, on Lake Mohave, the Black Canyon area between Willow Beach and Hoover Dam, and the lake area from Eldorado Landing north to the powerline crossing below Bighorn Cove. On Lake Mead, aircraft would not be permitted to land on the waters of the Gypsum Bed area on the southern portion of the Virgin Basin, in the Virgin River Bowl area, and on the waters between Iceberg Canyon and Grand Canyon National Park.

SANITATION AND LITTER

Under this alternative, shoreline sanitation would be addressed by the placement of shoreline and floating toilet facilities. Sustainable toilets would be placed at all drive-in shoreline sites within the urban park zones of Lakes Mead and Mohave. The number of toilets would be based on the level of visitation, with a ratio of one toilet for every 80 boats.

To encourage a greater use of boat pump-out facilities, separate pump-out facilities would be located in the vicinity of public launch ramps and at concession-operated marinas. These pump-out facilities would be designed to accommodate portable toilets as well as boat holding tanks. The use of portable toilets would be recommended under this alternative and would be supported by park education programs; however, the public's use of portable toilets would be voluntary.

The park would develop, in association with other agencies, an education program that would emphasize minimum-impact camping and proper sanitation behaviors.

Shoreline litter cleanup and recycling programs would be expanded. Glass and styrofoam would be prohibited in high-use areas, and litter bags would be available at launch ramps. Partnerships would continue to be established between community groups and local and state agencies to seek crews for shoreline cleanup.

RESOURCE PROTECTION

An important element of this alternative is the protection it would provide for the sensitive resources that are found in the waters or along the shorelines of Lakes Mead and Mohave. These areas are sensitive due to the habitat they provide for fish, bird, and mammal reproduction. Continued productivity is dependent on the protection of this sensitive habitat.

Inflow Areas

Under this alternative, the sensitive inflow areas of Lake Mead would be protected, including the Pearce Ferry Delta at the mouth of the Grand Canyon and the tributaries of the Muddy and Virgin Rivers on the Overton Arm. All of these areas, with the exception of the Muddy River, would be protected by prohibiting the use of motorized vessels, including personal watercraft.

Shoreline Enhancement

This alternative would provide for some shoreline enhancement projects, identified in the NPS *Resource Management Plan* (NPS 1999c), that address the removal of salt cedar in priority areas and the reestablishment of willows in certain locations along the Lake Mohave shoreline. Some adaptive management techniques, where salt cedar are pruned to provide shade for the establishment of other species, might be used to control salt cedar and provide additional beach environment. Such techniques have been used successfully in the Black Canyon area of Lake Mohave.

Water Quality

Protection of lake water quality from bacterial and chemical pollutants and suspended solids is an important element of this alternative. The monitoring of recreational water quality is in accordance with state of Arizona and state of Nevada recreational water quality standards. Bacterial water sampling would continue for popular areas within the urban park zones. Sampling of the more remote zones of the park would continue on a nonscheduled basis with parkwide sampling completed at least once during the high-visitation period. Ongoing water monitoring programs, mainly associated with the Las Vegas Wash inflow area, the intake facilities at the

Southern Nevada Water Authority, and selected high-use coves on Lake Mead, would continue. Studies would also continue at the Virgin River inflow area and various areas of the lake where water clarity is being monitored.

A one-time sampling, in cooperation with the U.S. Geological Survey, occurred in several high-use areas on Lakes Mead and Mohave in June 1999 and showed that gasoline and gasoline additives were present. Under this alternative, a monitoring program would be developed along with recreational water standards for lake management. Specific areas might require temporal or seasonal closures to maintain the high water quality standards required for recreational use.

Chemical pollutants emitted from carbureted two-stroke engines used in recreational boats and personal watercraft have been shown to discharge as much as 30% of their fuel unburned (CARB 1999, NPS 1999d). The pollutants include gasoline and gasoline additives. These pollutants have been found in high-use areas of Lakes Mead and Mohave. Under this alternative, a monitoring program would be developed along with recreational water quality standards for lake management. The EPA regulation requiring the marine industry to improve the efficiency of engines by the year 2006 would be adopted at Lake Mead National Recreation Area (EPA 1996a). The National Park Service would develop a new regulation requiring the immediate use of the new direct-injection two-stroke engines, or the equivalent, for motorized vessels.

Boat maintenance within the recreation area is also a source for chemical water pollutants. The National Park Service has prepared best management practices for these operations within the recreation area. The National Park Service would continue to keep abreast of the technology in this field and provide guidance for all concessioners and individual business permittees, as well as the general public who are involved in boat maintenance, commercial operations, and commercial and private fueling.

The refueling of boats and personal watercraft along the shoreline and in the waters of Lakes Mead and Mohave is also a source of chemical water pollution. In areas of intense boat and personal watercraft use, park personnel have observed a sheen on the water due to fuel spillage, which sometimes occurs during refueling activities. Title 36 CFR 2.14(7) prohibits polluting or contaminating park waters. Any fuel

spillage is considered a citable violation. Still, refueling of boats and personal watercraft along the shoreline and in the waters of Lakes Mead and Mohave continues to be a source of chemical water pollution. Increased boater education and the enforcement of applicable regulations could reduce this activity and lead to improved water quality in high-use areas. [In addition, the National Park Service will evaluate the operation of all facilities on Lakes Mead and Mohave in accordance with the modified settlement agreement.](#)

Threatened, Endangered, and Sensitive Species

Threatened and endangered fish species occur in both Lakes Mead and Mohave, and monitoring and enhancement programs are underway. Critical habitat for the razorback sucker (*Xyrauchen texanus*) and the bonytail chub (*Gila elegans*) have been identified in Lake Mohave, and critical habitat for the razorback sucker has been identified in Lake Mead. Recreational use, including boating and personal watercraft use, has not been shown to impact bonytail chub or razorback suckers. Fish species would continue to be monitored to determine if recreational use creates adverse impacts. If recreational impacts were identified in the future, special zoning might be used to close areas to recreational use and provide a higher level of protection for this habitat during critical periods in their life cycle.

[Four sensitive plant species, the sticky buckwheat, three-sided milkvetch, Las Vegas bearpoppy, and sticky ringstem,](#) occur in sandy soils along the shoreline of Lake Mead in areas receiving heavy recreational use. In addition, smoke tree and *Trixis californica* (no common name) populations occur along southern Lake Mohave. These populations would be monitored, and where unacceptable impact was identified from associated visitor use, such as trampling or cutting, special management steps would be taken to protect this habitat.

Cultural Resources

[Both prehistoric and historic resources are known to occur along the shorelines of Lakes Mead and Mohave. These resources have been documented in the developed areas and in a small number of other areas around the lakes. A system to monitor the sites along the shorelines is being developed. The monitoring would continue under this alternative. To](#)

ensure protection of these resources, special zones might be applied that would limit recreational activities where sensitive resources were identified.

A number of submerged prehistoric and historic resources have been documented under Lakes Mead and Mohave. These resources would be preserved in compliance with NPS *Management Policies* and objectives.

Submerged prehistoric and historic resources have been documented to occur within Lakes Mead and Mohave. These resources would be preserved in compliance with NPS *Management Policies* and objectives.

To protect cultural resources and to comply with the *National Historic Preservation Act*, all proposed projects would be evaluated to determine the area of potential effect. These areas would be inventoried for significant cultural resources, and a determination would be made as to what impact the project would have on the historic qualities of the resources. Through consultation with project designers, affiliate tribal entities, the respective State Historic Preservation Offices, and the Advisory Council on Historic Preservation, a plan would be developed to avoid or mitigate impacts.

PARK OPERATIONS

In addition to the 105 additional positions identified in alternative A that are necessary to effectively manage the recreation area, at least 2 additional law enforcement officers and 5 to 6 additional interpreters for each lake would be required to develop and implement a boating safety program. Four additional interpretive staff would be required to develop and implement an education program on the new lakeshore sanitation requirements. Three additional seasonal interpretive rangers would be required to provide education on water quality concerns on the lakes. At least 6 additional maintenance staff would be needed for each lake to install and maintain the increased number of backcountry toilets. Six additional personnel would be required to implement the water monitoring program. This alternative requires 41 new full-time or seasonal field personnel at Lake Mead National Recreation Area in addition to those identified in alternative A; a total of 146 positions above the current staffing level would be required under this alternative to effectively manage the recreation area.

ALTERNATIVE C: MODIFIED PREFERRED ALTERNATIVE

GENERAL CONCEPT

This alternative addresses the NPS mission as well as the management objectives and long-term vision for Lakes Mead and Mohave. The need to protect the natural environment and support the recreational interests of park visitors is recognized under this alternative. Under this alternative, 5% of the waters would be managed for semiprimitive or primitive, yet provide for an increase in boating activities. Two-stroke engines would be allowed on the waters, but would be required to be in compliance with the 2006 EPA emission standards within 10 years of the approval of this plan or 2012. Specific actions to address personal watercraft use, shoreline and boating conflicts, and litter and sanitation issues are included under this alternative. Table 2 provides a summary of the actions proposed under this alternative, as well as the actions proposed under the other alternatives.

RECREATIONAL OPPORTUNITY ZONING

The range of recreational opportunities under this alternative for Lake Mead National Recreation Area is shown in tables 19 and 20 and in figure 9.

Under this alternative, a range of recreational opportunities from primitive to urban park would be provided (figure 9). The range of opportunities is responsive to the public's desire for the National Park Service to provide a mix of recreational settings while maintaining or slightly increasing the overall level of boating activity on the lakes. Under this alternative, a boating capacity of 5,055 boats at any one time, established in appendix B (page 314), would be allowed on Lakes Mead and Mohave, an increase of approximately 878 boats at peak use during a typical summer weekend. A boating capacity of 3,295 boats at any one time would be allotted to Lake Mead and 1,760 boats at any one time would be allotted to Lake Mohave.

Primitive areas would be established on Lake Mead at the Gypsum Beds and at the inflow area of the Virgin River and would comprise approximately 1% of the lake surface. The semiprimitive areas on Lake Mead would be located in the Muddy River inflow area (Overton Wildlife Management Area), Bonelli

Bay, and Grand Wash Bay. The Overton Wildlife Management Area has been managed in the past, similar to the semiprimitive setting, with flat-wake speed restrictions during part of the year. This designation will not change the management of the Overton Wildlife Management Area, but will extend the flat-wake speed restrictions year-round under the semiprimitive designation. The maps were modified to reflect this designation.

The West Gypsum Bay area was closed to all boating for use as a research area up until 1998. The semiprimitive classifications would compose approximately 4% of the water surface. These areas would be identified by buoys.

TABLE 19: RANGE OF RECREATIONAL OPPORTUNITIES AT LAKE MEAD UNDER ALTERNATIVE C

Recreation Opportunity Spectrum Class	Surface Acres ¹	Percentage
Primitive	803	1
Semiprimitive	5,946	4
Rural natural	58,100	45
Urban natural	19,725	15
Urban park	45,725	35
Total	130,299	100

1. Based on a lake elevation of 1,180 feet above mean sea level.

TABLE 20: RANGE OF RECREATIONAL OPPORTUNITIES AT LAKE MOHAVE UNDER ALTERNATIVE C

Recreation Opportunity Spectrum Class	Surface Acres	Percentage
Primitive/ Semiprimitive	595	2
Semiprimitive	0	0
Rural natural	3,969	15
Urban natural	13,936	51
Urban park	8,899	32
Total	27,399	100

The area above Paiute Point extending to the mouth of the Grand Canyon would be managed for rural natural or semiprimitive, depending on whether Grand Canyon National Park would allow motorized boat traffic to enter the canyon from Lake Mead National Recreation Area. If boating traffic is authorized to enter the Grand Canyon, this area would be managed as rural natural. If the Grand Canyon is closed to boats entering from Lake Mead National Recreation Area, then the zone would be managed as semiprimitive. The urban area for Lake Mead is concentrated in Boulder Basin and would be expanded under this alternative to include the central portion of the Overton Arm, where the boating capacity would be expanded by 300 boats.

On Lake Mohave, the primitive and semiprimitive areas would comprise approximately 2% of the water surface and would include Black Canyon above Willow Beach. In this area, temporal zoning would be applied, providing a range of recreational settings. The area would be managed for a primitive setting two days per week on a year-round basis. Between Labor Day and Memorial Day, the area would be managed for a semiprimitive setting five days per week. During the summer months between Memorial Day and Labor Day, the area would be managed for a rural natural setting with only houseboats, waterskiing, and wakeboarding prohibited. The rural natural setting includes zones 4, 5, 6, and 7. Personal watercraft use is consistent with the park's purpose and management objectives for this area. However, due to the canyon setting in zones 8 and 9, personal watercraft use would be monitored during this period and restricted if the safety of lake users becomes an issue. This would be determined by observed and/or reported conflict information and boating incidents.

The urban park zone would include zones 1 and 2, with expansion into a portion of zone 3, including the Cottonwood Cove area. In this area, the boating capacity would be increased by approximately 200.

The increase in boating capacity would target areas where growth could be accommodated within the physical, environmental, and social carrying capacity. Specific locations for growth are in zones 17, 18, and 20 on Lake Mead and zones 3, 4, and 5 on Lake Mohave. These zones are recreational destinations and could accommodate additional visitation without compromising the physical, environmental, and social carrying capacity criteria identified for each zone.

FACILITIES

In cooperation with the Nevada Division of Wildlife, a boating education facility is being developed within the recreation area in the Boulder Beach area, with the potential for an additional boating education facility to serve Lake Mohave and the southern portion of the recreation area. The Lake Mohave boating education center would likely be constructed outside the park boundary unless there may be an adaptive reuse of an existing facility at Katherine Landing. As stated in the recreational opportunity section, this alternative would accommodate some growth in the number of boats allowed on both Lakes Mead and Mohave. Under this alternative, the additional facilities required to accommodate a larger boating capacity would be divided between public and commercial facilities. For the purposes of lake access, public launch facilities would include the construction of new or the expansion of existing launch ramps. Commercial facilities could include the addition of slips in the marina, the addition of spaces in dry boat storage, and the addition of boats in the rental fleet. Tables 21 and 22 show the number of commercial marina services at Lake Mead and Lake Mohave, respectively, while tables 23 and 24 show the number of public launch facilities.

On Lake Mead, this alternative would allow for the construction of new facilities at Stewarts Point, the expansion of facilities at Overton Beach and Temple Bar, the expansion of a parking area and a 180 slip addition at Echo Bay, and an increase of 200 marina slips at Callville Bay (table 25). The additional number of boats would be accommodated through the expansion of both public and commercial facilities.

Implementation of this alternative for Lake Mohave would be accomplished by expanding the commercial facilities at Cottonwood Cove and constructing new lake access in the Eldorado Canyon area. At Cottonwood Cove, it is proposed to separate the commercial and public marina operations. This would require the use of Ski Cove located immediately south of the existing marina. It is proposed to relocate the picnic area, public marina, and fuel sales, while the rental boat operation, motel, restaurant, and store would remain in their existing locations. The traffic circulation and parking would be designed to provide increased boating access to the center of Lake Mohave. This expansion would add an estimated 150 boats at any one time to the lake capacity. The expansion at Cottonwood Cove would require a site-specific development plan and a compliance document.

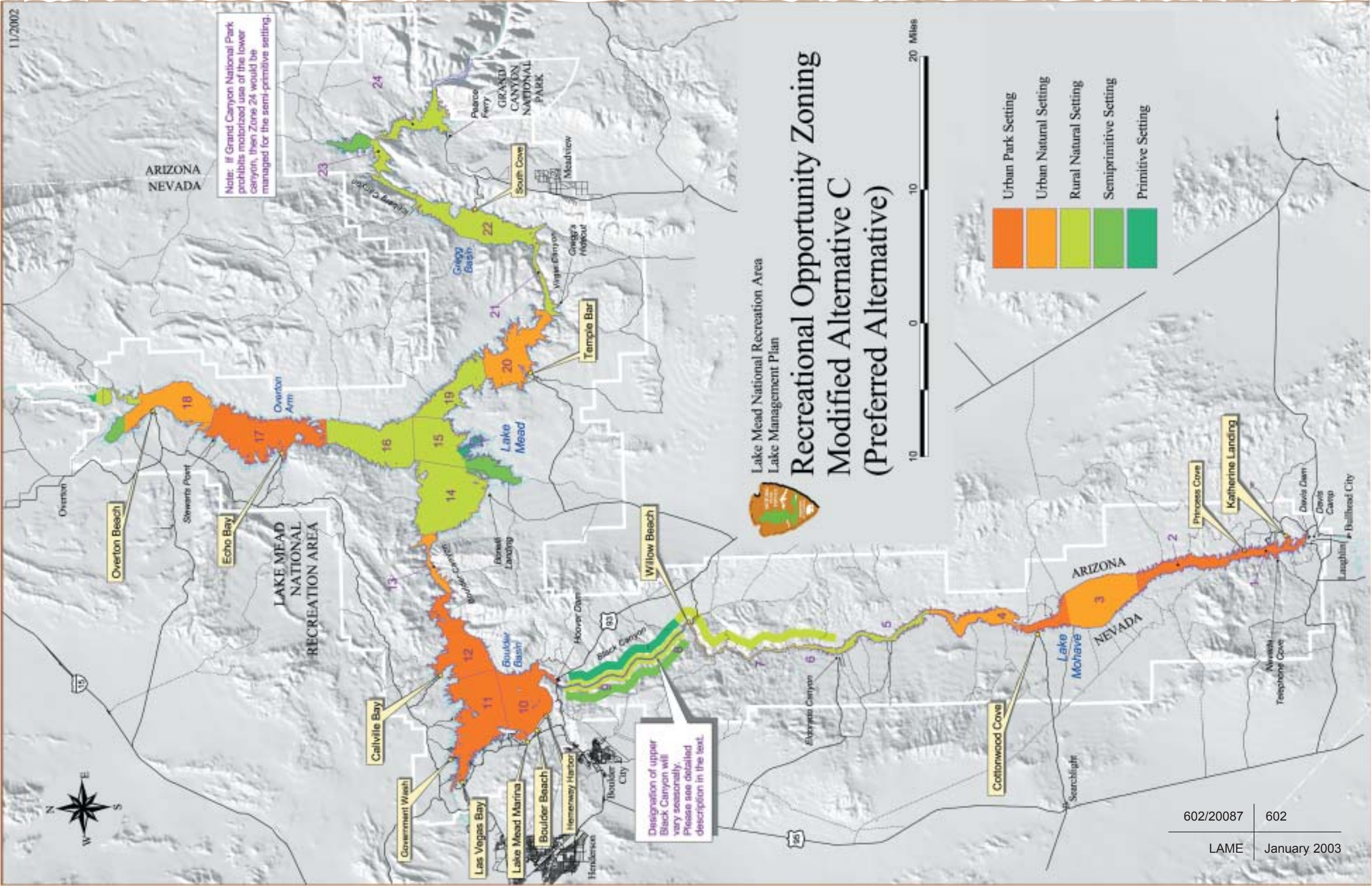


FIGURE 9: RECREATIONAL OPPORTUNITY ZONING UNDER ALTERNATIVE C (MODIFIED PREFERRED ALTERNATIVE)

TABLE 21: COMMERCIAL MARINA SERVICES AT LAKE MEAD UNDER ALTERNATIVE C

	Overton Beach	Echo Bay	Callville Bay	Las Vegas Boat Harbor	Lake Mead Resort	Temple Bar	Total
Rentals							
Houseboats							
Authorized ¹	0	72	75	0	0	45	192
Existing ²	0	72	65	0	0	0	137
Personal watercraft							
Authorized	20	20	20	20	20	20	120
Existing	12	8	20	18	10	4	72
Other boats							
Authorized	12	23	26	47	31	13	152
Existing	7	23	26	47	31	13	147
Wet Storage							
Wet slips							
Authorized	185	540	847	635	755	395	3,357
Existing	140	360	647	635	755	95	2,632
Mooring buoys							
Authorized ³	0	0	0	0	0	0	0
Existing	0	19	0	0	0	5	24
Dry Storage							
Dry storage spaces							
Authorized	80	60	120	388	55	200	903
Existing	80	60	120	388	55	200	903
Parking							
Single spaces							
Authorized	281	217	462	285	145	425	1,815
Existing	181	217	337	285	145	125	1,290
1. Existing number plus the proposed expansion under alternative C. 2. Existing as of September 6, 2001. 3. Mooring buoys would be phased out after implementation of the proposed expansion under alternative C.							

TABLE 22: COMMERCIAL MARINA SERVICES AT LAKE MOHAVE UNDER ALTERNATIVE C

	Cottonwood Cove	Willow Beach	Katherine Landing	Total
Rentals				
Houseboats				
Authorized ¹	22	0	44	66
Existing ²	22	0	44	66
Personal watercraft				
Authorized	20	0	20	40
Existing	12	0	16	28
Other boats				
Authorized	20	18	49	87
Existing	20	18	49	87
Wet Storage				
Total wet slips				
Authorized	484	125	824	1,433
Existing	234	0	824	1,058
Mooring buoys				
Authorized ³	0	0	0	0
Existing	27	0	0	27
Dry Storage				
Total dry storage spaces				
Authorized	300	0	150	450
Existing	300	0	150	450
Parking				
Single spaces				
Authorized	500	200	325	1,025
Existing	153	200	325	678
<p>1. Existing number plus the proposed expansion under alternative C.</p> <p>2. Based on the number of 12-foot launch lanes multiplied by 8 (number of launches per hour) times 12 (number of daylight hours) divided by 2 (half are launches and half are retrievals).</p> <p>3. Mooring buoys would be phased out after implementation of the proposed expansion under alternative C.</p>				

TABLE 23: PUBLIC LAUNCH FACILITIES AT LAKE MEAD UNDER ALTERNATIVE C

	Overton Beach	Stewarts Point	Echo Bay	Callville Bay	Government Wash ¹	Las Vegas Bay	Lake Mead Resort	Hemenway Wash	Temple Bar	South Cove	Pearce Ferry ¹
Launch lanes											
Authorized ²	4	4	6	13	8	4	4	4	6	8	2 (gravel)
Existing ³	4	0	6	13	8	4	4	4	6	8	2 (gravel)
Launch lane capacity	192	192	288	576	384	192	192	192	288	384	96
Pull-through parking ⁴											
Authorized	200	150	273	333	150	222	85	175	288	116	50
Existing	200	0	173	333	150	222	85	175	219	116	50
Courtesy dock	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fish-cleaning station	Yes	No	Yes	Yes	No	Yes ⁵	No	Yes	Yes	No	No
<p>Notes:</p> <p>1. Pearce Ferry and Government Wash are closed due to low-water conditions when lake elevations are at 1,175 feet above sea level or below.</p> <p>2. Existing number plus the proposed expansion under alternative C. The number of launch lanes at the facilities may be affected due to low-water conditions.</p> <p>3. Based on the number of 12-foot launch lanes multiplied by 8 (number of launches per hour) times 12 (number of daylight hours) divided by 2 (half are launches and half are retrievals).</p> <p>4. Double parking space for vehicle with trailer.</p> <p>5. There are two fish-cleaning stations at Las Vegas Bay.</p>											

TABLE 24: PUBLIC LAUNCH FACILITIES AT LAKE MOHAVE UNDER ALTERNATIVE C

	Eldorado Canyon	Cottonwood Cove	Willow Beach	Princess Cove	North Telephone Cove	Katherine Landing
Launch lanes						
Authorized ¹	4	15	8	8	2	8
Existing	0	15	8	8	2 (gravel)	8
Launch lane capacity ²	192	720	384	384	96	384
Pull-through parking ³						
Authorized	100	322	155 ⁴	100	100	469
Existing	0	222	155 ⁴	100	100	469
Courtesy dock	No	Yes	Yes	Yes	No	Yes
Fish cleaning station	No	Yes	Yes	No	No	Yes
<p>1. Existing number plus the proposed expansion under alternative C.</p> <p>2. Based on the number of 12-foot launch lanes multiplied by 8 (number of launches per hour) times 12 (number of daylight hours) divided by 2 (half are launches and half are retrievals).</p> <p>3. Double parking space for vehicle with trailer.</p> <p>4. (NPS 1995).</p>						

TABLE 25: SUMMARY OF BOATING CAPACITIES FOR FACILITIES AT LAKE MEAD UNDER ALTERNATIVE C

Facility Locations	Commercial ¹ Marina Launch Capacity	Public ² Launch Ramp Capacity	Total Launch Capacity	Single Space Parking Capacity	Pull- Through ³ Parking Capacity	Total Parking Capacity	Actual ⁴ Launch Capacity	Proposed Expansion	Revised ⁵ Launch Capacity	Carrying Capacity ⁶ (BAOT) ⁷
Hemenway Ramp	0	192	192	0	175	175	175		175	
Lake Mead Marina	197	192	389	145	85	230	230		230	
Las Vegas Bay	230	192	422	285	222	507	422		422	
Government Wash	0	385	385	0	150	150	150		150	
Callville Bay	274	576	825	337	333	670	607	200 slips + 125 sps ⁸	647	
Misc. Launches					200	200	200		200	
Total							1,784		1,824	1,669
Echo Bay	181	288	469	217	173	390	354	180 slips, 100 sps, + 100 dps ³	490	
Stewarts Point	0	0	0	—	100 ⁹	100	100	1 ramp +150 dps	150	
Overton Beach	48	192	250	181	200	385	248	45 slips + 100 sps	258	
Total							702		898	988
Temple Bar	101	288	389	125	219	344	320	300 slips + 100 sps	380	
South Cove	0	385	385	53	116	169	116		116	
Pearce Ferry	0	96	50		50	50	50		50	
Total							486		546	638
Total	1,031	2,786	3,756	1,343	2,023	3,370	2,972		3,268	3,295

1. Assumes 20% of the boats in wet slips, 10% of the boats in dry storage, and 100% of the rental fleet are on the lake at any given time (see table 21).
2. Based on the number of 12-foot launch lanes multiplied by 8 (number of launches per hour) times 12 (number of daylight hours) divided by 2 (half are launches and half are retrievals) (see table 23). The number of launch lanes at the facilities may be affected due to low-water conditions.
3. Double parking space for vehicle with trailer.
4. Actual launch capacity is the sum of the limiting factor for marina launches plus the limiting factor for launches using the public launch ramp. The limiting factor for marina launches is the smaller of the commercial marina launch capacity and the number of single parking spaces available. The limiting factor for public launches is the smaller of the public launch ramp capacity and the number of pull-through parking spaces available.
5. Actual launch capacity plus proposed expansion (assumptions in footnote (1) apply).
6. Carrying capacity reflects the recommended maximum number of boats on the water at any one time.
7. Boats at any one time.
8. Single parking spaces.
9. Undeveloped parking. Proposed expansion would develop these 100 pull-through spaces plus 50 more.

A site in the vicinity of Eldorado Canyon would be considered for development under this alternative if all safety and access requirements were met. Carrying capacity limits would support development in this area, and access roads and [limited](#) utilities are already in place. The potential facilities at Eldorado Canyon would include the development of a public launch ramp, pull-through parking for 100 vehicles, solar lighting, vault toilets, and an entrance station. The development of a launch facility at Eldorado Canyon (similar to the Princess Cove facility) would add an additional 100 boats at any one time, bringing the total increase in boating capacity to 250 on Lake Mohave. If an appropriate site was found in the area, engineering and facility design and additional environmental analysis would be completed prior to any development. Table 26 summarizes the carrying capacities for facilities on Lake Mohave.

This alternative would allow for the construction of a shoreline access road between Government Wash and Box Car Cove on Lake Mead. It would also allow for the development of a new shoreline campground at Government Wash.

A boating education center for Lake Mead would be developed at Boulder Beach within the urban interface area. [A second boating safety center could be built for Lake Mohave.](#) All other public and commercial facilities would be capped at the existing development levels. Each of the development areas would be improved to define parking for public and commercial uses, which would serve as the key management action for the administration of carrying capacity necessary to provide a range of recreational settings and opportunities. Parking capacity would include both single and pull-through spaces necessary to implement the proposed carrying capacity.

[This alternative requires the National Park Service to manage for carrying capacity. While the capacity set by this alternative is exceeded at most facilities on Memorial Day weekends, it also is exceeded on some non-holiday summer weekends at Katherine Landing on Lake Mohave and Callville Bay on Lake Mead. Operating at facility capacity is reflected by all parking facilities being filled and parking overflowing to the road shoulders of access roads or to campgrounds that receive little use during the hot summer months. Each of these areas has parking lots that are well-defined, with paving and striping to delineate parking areas. Many of the areas on Lake Mead do not have paved parking areas, and low-water conditions allow for significant increases in](#)

[parking. Where parking is not the limiting factor for capacity, the width of the launch ramp becomes the limiting factor.](#)

The width of the launch ramp, number of slips in the marina, and parking are the primary management tools used to manage lake carrying capacity. As parking is exhausted in specific areas, visitors would be directed to other lake access facilities where capacity has not been reached. Parking would not be authorized outside the designated parking areas. This would, in effect, limit the number of boats on the lake at any time and also the number of boats using the different zones on the lake. In the long-term, a reservation or permitting system might be needed to manage for the carrying capacity. [Until that time, however, the availability of parking spaces would continue to be managed on the current first-come, first-serve basis, which gives all visitors equal access to parking at each facility.](#)

[In September 2002, low-water conditions and the expanding delta in the Las Vegas Bay forced the National Park Service and marina operators at the Las Vegas Boat Harbor to evaluate alternatives related to the temporary relocation of the marina. An environmental assessment was released to determine the short-term and interim options for a marina relocation or potential closure. A final decision was made for the interim location in late September, and marina operations were moved to Horsepower Cove in early October \(management preferred alternative\). The marina operation will remain in Horsepower Cove until an amendment to the *Lake Mead National Recreation Area General Management Plan* is prepared that will address all low-water concerns related to concession operations on Lake Mead.](#)

[The Laughlin Chamber of Commerce has recommended a reservation system be considered for Katherine Landing due to the formation of launch lines that can require up to an hour's wait. These launch lines typically occur from 6 P.M. to 9 P.M. on Saturday of most summer weekends for boat retrieval. While there is support for evaluation of this management action within the Laughlin Chamber of Commerce, there has been little support for such an action on the part of the public. The National Park Service would work with the Laughlin community and the boating public to investigate the use of a reservation system. If such a system is determined appropriate, an experimental reservation system could be tested at Katherine Landing, and if](#)

TABLE 26: SUMMARY OF BOATING CAPACITIES FOR FACILITIES AT LAKE MOHAVE UNDER ALTERNATIVE C

Facility Locations	Commercial ¹ Marina Launch Capacity	Public ² Launch Ramp Capacity	Total Launch Capacity	Single Space Parking Capacity	Pull- Through ³ Parking Capacity	Total Parking Capacity	Actual ⁴ Launch Capacity	Proposed Expansion	Revised ⁵ Launch Capacity	Carrying Capacity ⁶ (BAOT) ⁷
Katherine Landing	293	385	678	325	469	794	678		678	
Telephone Cove	0	86	100	78	100	178	86		86	
Princess Cove	0	385	385	50	100	150	100		100	
Total							864		864	820
Cottonwood Cove	138	720	858	153	222	375	360	250 slips + 100 dps ³	510	
Eldorado Canyon			0			0	0	1 ramp +100 dps	100	
Total							360		610	750
Willow Beach	50	384	434	200	155 ⁸	355	205		205	
Total							205		205	200
Total	481	1,960	2,455	806	1,046	1,852	1,429		1,679	1,760
<p>1. Assumes 20% of the boats in wet slips, 10% of the boats in dry storage, and 100% of the rental fleet are on the lake at any given time (see table 22).</p> <p>2. Based on the number of 12-foot launch lanes multiplied by 8 (number of launches per hour) times 12 (number of daylight hours) divided by 2 (half are launches and half are retrievals) (see table 24).</p> <p>3. Double parking space for vehicle with trailer.</p> <p>4. Actual launch capacity is the sum of the limiting factor for marina launches plus the limiting factor for launches using the public launch ramp. The limiting factor for marina launches is the smaller of the commercial marina launch capacity and the number of single parking spaces available. The limiting factor for public launches is the smaller of the public launch ramp capacity and the number of pull-through parking spaces available.</p> <p>5. Actual launch capacity plus proposed expansion (assumptions in footnote (1) apply).</p> <p>6. Carrying capacity reflects the recommended maximum number of boats on the water at any one time.</p> <p>7. Boats at any one time.</p> <p>8. (NPS 1995).</p>										

successful, such a system could be employed on a permanent basis during periods of heavy demand and long waits on the launch ramp. The operational details for the implementation of a reservation system have not yet been developed, but would be designed in consultation with areas where reservation systems are currently in place.

Recreational fishing programs are actively managed for Lakes Mead and Mohave. Fish stocking programs are in place for both reservoirs, and shoreline fishing facilities have been constructed at Katherine Landing on Lake Mohave and at Hemenway Point and the causeway to Pyramid Island on Lake Mead. Earthen causeways have been constructed at Echo Bay and at the Southern Nevada Water Authority area to provide additional fishing areas. These, while not exclusively used for fishing, provide an area for shoreline fishing. Additional facilities are proposed for Cottonwood Cove and Willow Beach on Lake Mohave and at Government Wash and Echo Bay on Lake Mead. At these locations, habitat enhancement studies would be conducted to increase the underwater structural habitat that may hold the fish in the stocking areas. Underwater structural habitat would be developed in suitable areas. Additional shoreline fishing access beyond what is presented in this plan might be developed in the future in cooperation with the Nevada Division of Wildlife and the Arizona Game and Fish Department. [Additional sites may be authorized for shoreline fishing in response to fluctuating water levels.](#)

Minor facilities, such as parking areas, might be established in areas previously disturbed to support shoreline zoning.

VISITOR CONFLICT

Visitor conflict is addressed using a parkwide approach, by means of recreational opportunity zoning, and an area-specific approach, which includes shoreline zoning in urban interface areas.

Shoreline Zoning

Boulder Basin. Shoreline zoning is currently used to separate conflicting uses along Boulder Beach. This method of recreation management has, until recently, been successful in accommodating the variety of uses along that shoreline of Lake Mead that is most accessible to the adjacent urban community of Las

Vegas. This urban interface area includes the shoreline area from Boxcar Cove to Kingman Wash, including Crawdad Cove, Government Wash, Gypsum Wash, Las Vegas Bay, 33-Hole, Pumpphouse Cove, Saddle Cove, Boulder Beach, Horsepower Cove, the Hemenway Wall, and Kingman Wash.

Over the last five years there has been an increase in the demand and use of this shoreline area corresponding with the growth of the Las Vegas Valley. Some recreational activities conflict with others such as fishing and SCUBA. There is increased competition for shoreline space between these and other user groups. Physical separation of recreational activities is provided for under this alternative, and some areas are managed for specific activities only. Shoreline uses vary by season, but the proposed zoning addresses shoreline management on a year-round basis. Uses addressed in this zoning proposal are fishing, no watercraft areas, SCUBA, paddlecraft, sailboarding, personal watercraft, and shoreline camping. The proposed zoning also recognizes the establishment of a slalom course for waterskiing and personal watercraft use, as well as the option for recreation equipment rental at Boulder Beach. Under this alternative, some recreational activities would be restricted to specific sites to reduce conflict within this urban interface area (figure 10). At lower lake levels, shoreline zoning might be modified to maintain the mix of recreational activities (see "Appendix C: [Summary of Operations Under Forecasted Water Elevations](#)").

Shoreline fishing areas would be designated and protected by restricting boats, waterskiing and wakeboarding, personal watercraft, SCUBA diving, and swimming. Fish-stocking programs under the administration of the Nevada Division of Wildlife would continue within this zone at designated fishing sites. Fishing piers or earthen dikes might be constructed to support fishing activities in areas where fishing is designated as the primary recreational activity. Habitat enhancements to support recreational fishing might also be incorporated at these locations. With the exception of designated harbors (SCUBA and no watercraft areas), fishing could occur along the majority of the Boulder Beach shoreline. [The National Park Service would continue to work with the respective state agencies and would maintain flexibility in the identification of fish stocking locations.](#)

Designated SCUBA areas would be closed to boating except in support of dive operations, and fishing

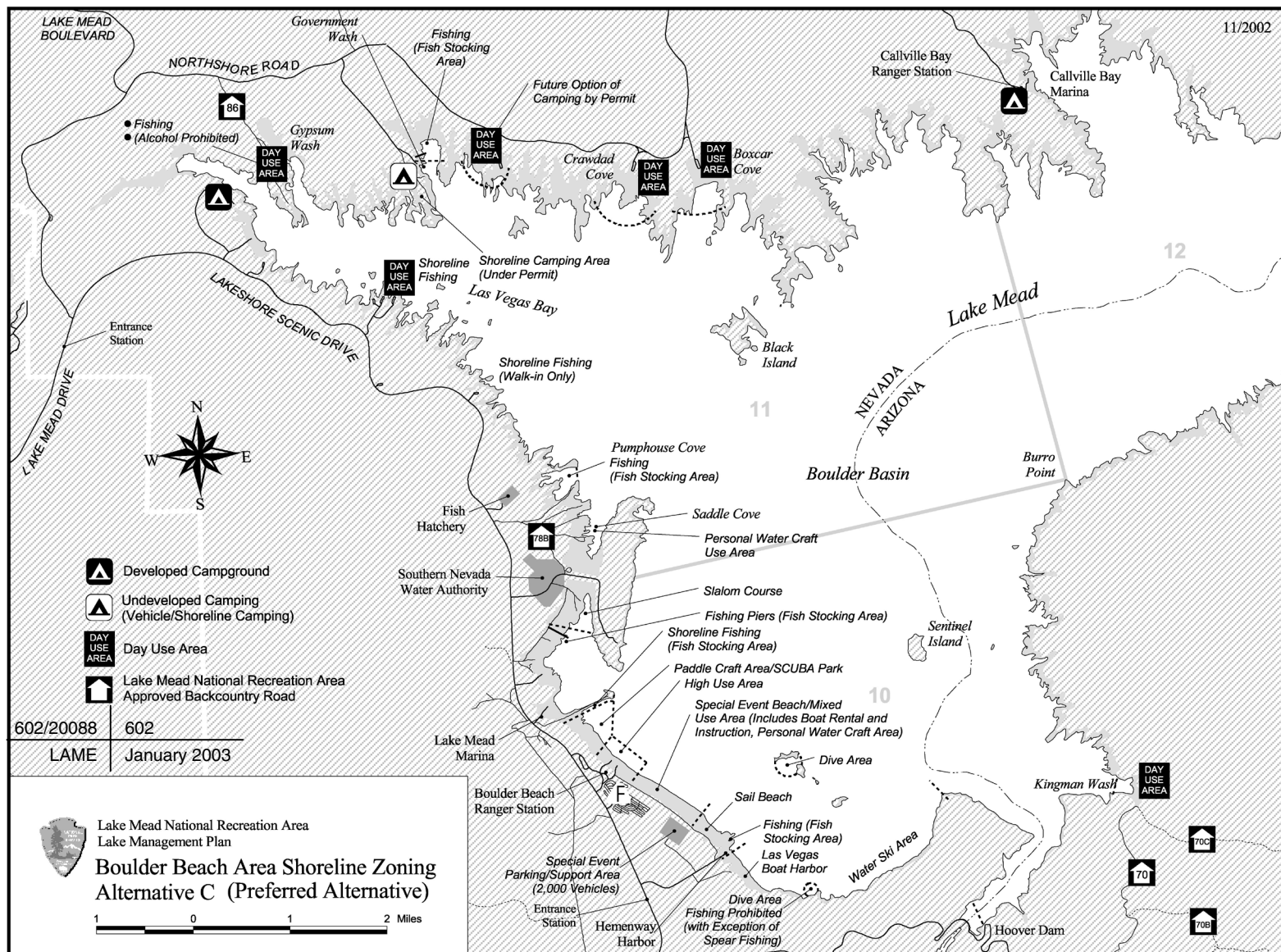


FIGURE 10: BOULDER BEACH ZONING UNDER ALTERNATIVE C (MODIFIED PREFERRED ALTERNATIVE)

Alternative C: Modified Preferred Alternative

would be prohibited. SCUBA diving would be prohibited in harbors, designated fishing areas, designated personal watercraft areas, and designated sailing areas. Speargun fishing would only be authorized within designated SCUBA areas or undesignated shoreline areas.

In certain locations, including specific areas at Boulder Beach, only shoreline-based activities would be allowed, such as SCUBA diving from the shoreline and picnicking. The inclusion of the 200-foot flat-wake area is to provide greater protection around beaches frequented by bathers, boats at the shoreline, and near people in the water and at the water's edge. It would also provide protection for vessels at the shoreline from the wakes of boats operating in close proximity. Personal watercraft, waterskiing, and wakeboarding would be prohibited in areas designated for fishing or SCUBA, as well as other high-use areas. Launching of all boats, personal watercraft, would be limited to designated launch facilities or areas.

The sailing beach is an area that is managed to support sailboard and sailboat use. However, there is limited use of this area, and other boaters, including personal watercraft users, might launch and operate out of this location. There is a proposal to relocate the gate that currently restricts overnight access at Boulder Beach in order to allow 24-hour access to the sailing beach. Should sailing use increase and conflict develop between these users, personal watercraft and motorized vessels might be prohibited at a future date.

Vehicle and shoreline camping is currently authorized at Kingman Wash, Boxcar Cove, Crawdad Cove, and Government Wash. Kingman Wash, Boxcar Cove, and Crawdad Wash are located within flood hazard areas and would be closed to camping under this alternative. Shoreline camping would be authorized within the urban interface area at Government Wash where it would be accommodated by limited facility development and a permit system. Future shoreline camping may be provided at the end of 8.0 Mile Road, opposite Government Wash, if the experimental permit system at Government Wash was successful. Carrying capacity would be determined for camping and other shoreline uses while preserving the integrity of the recreational setting and accommodating a mix of overnight and day use. The actual camping areas would fluctuate with the water level.

Katherine Landing Area. Under this alternative, shoreline zoning would be established to separate conflicting uses in the Katherine Landing area. As the adjacent urban communities of Laughlin, Nevada, and Bullhead City, Arizona, grow and visitation from California residents increases, the demand and use of this shoreline area would increase. Some recreational activities conflict with others such as fishing and SCUBA. There is increasing competition for shoreline space between these and other user groups. Physical separation of recreational activities would be provided for under this alternative, and some areas would be managed for specific activities only.

This plan does not zone, in detail, the shoreline in the urban interface zone of southern Lake Mohave. The plan lists a mix of activities that are appropriate in these areas but does not list a single activity as the primary recreational activity. Additional analysis is needed to more specifically partition these areas. This more detailed zoning would be completed in cooperation with appropriate state agencies.

This urban interface zone is described as the shoreline area on the Arizona side of Lake Mohave from Stop Sign Cove and north to Mineshaft Cove, including Katherine Landing, Telephone Coves (north and south), Cabinsite Point, Arrowhead Cove, Gasoline Alley, and Princess Cove; on the Nevada side of Lake Mohave, the urban interface zone includes Rock House Cove and Telephone Cove.

The uses addressed in this zoning proposal are fishing, SCUBA, sailboarding, personal watercraft use, boat and personal watercraft launching, vehicle to shoreline camping, and day-use activities such as picnicking. Under this alternative, some recreational activities would be restricted to specific sites to reduce conflict within this urban-influenced area (figure 11).

With the exception of designated harbors, SCUBA areas, and areas where concentrated shoreline-based recreation occurs, fishing could occur along the majority of the Lake Mohave shoreline. In areas where fishing is the primary recreation activity, shoreline fishing areas would be designated and protected by restricting boats, personal watercraft, waterskiing, wakeboarding, SCUBA diving, and swimming. Designated areas could include zones within Princess Cove, Arrowhead Cove, Katherine Landing, Cabinsite Cove, and Nevada Telephone Cove. Fishing piers or earthen dikes might be constructed to support fishing activities in these

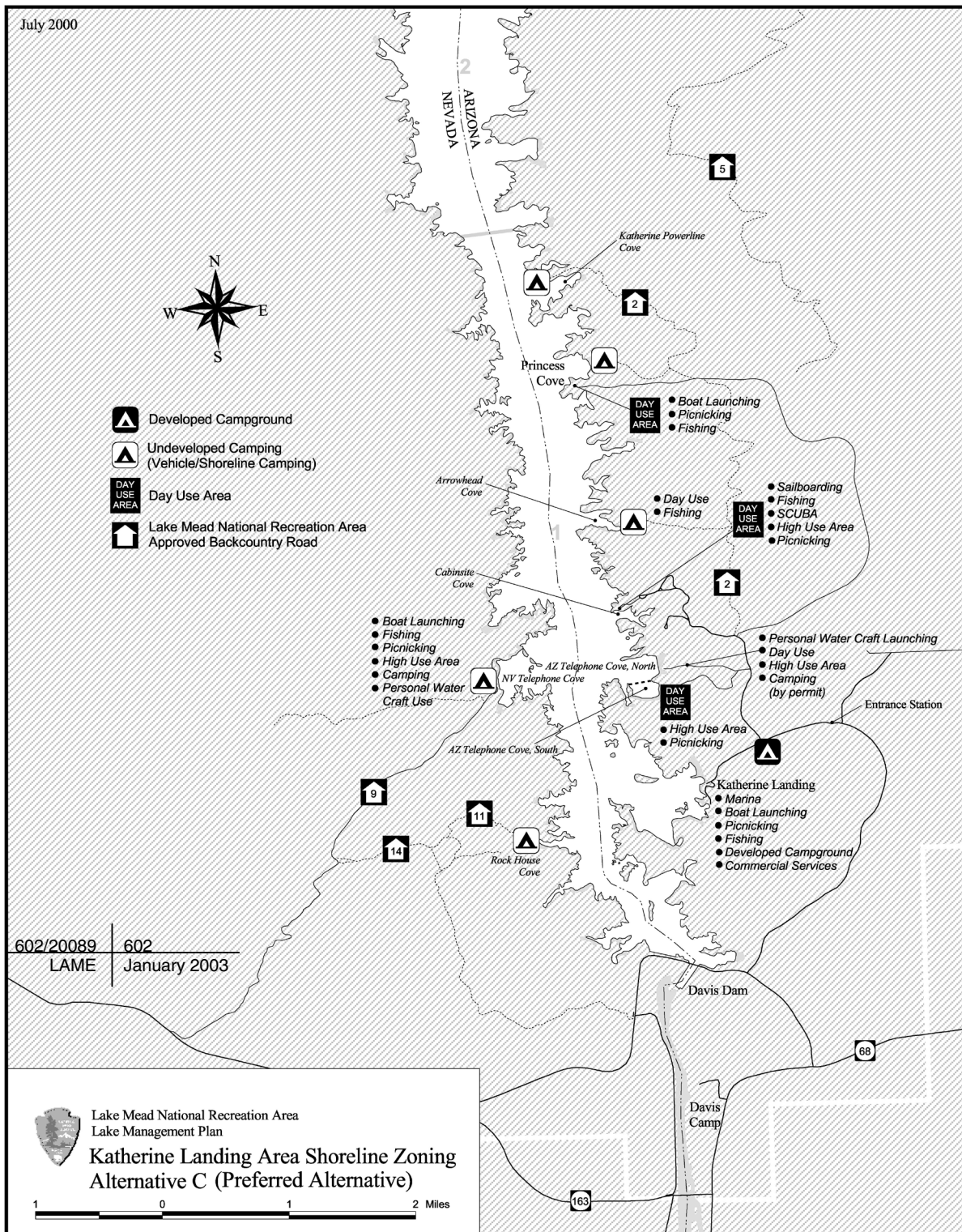


FIGURE 11: KATHERINE LANDING ZONING UNDER ALTERNATIVE C (MODIFIED PREFERRED ALTERNATIVE)

areas. Habitat enhancements to support recreational fishing might also be incorporated at these locations. Prior to any individual actions for enhancement on Lake Mohave, consultations would occur with the U.S. Fish and Wildlife Service, [Nevada Division of Wildlife](#), and the [Arizona Game and Fish Department](#) to ensure protection of native fish species.

[The inclusion of the 200-foot flat-wake area around beaches frequented by bathers, boats at the shoreline, and near people in the water and at the water's edge also pertains to Lake Mohave. It would also provide protection for vessels at the shoreline from the wakes of boats operating in close proximity. Boat launching, including personal watercraft, at North Telephone Cove and Cabinsite Point might be closed to maintain a mix of recreational settings.](#)

The South Telephone Cove area in Arizona would be the only area in the urban interface zone where motorized vessels would be prohibited because of shoreline-based water recreational activities. In this area, shoreline-based activities would be the only authorized recreational activities.

[Limited vehicle and shoreline camping would be authorized at Mineshaft Cove, Princess Cove \(off approved road 2C\), Rock House Cove, and Telephone Cove, Nevada. Camping in flash-flood zones would be discouraged. North Telephone Cove, Arizona, would be closed to camping. Shoreline camping would be authorized within the urban interface zone at Nevada Telephone Cove, where it would be accommodated by limited facility development and a permit system. Carrying capacity would be determined for camping and other shoreline uses while preserving the integrity of the recreational setting and accommodating a mix of overnight and day use. An entrance station might be required at this location in the future.](#)

Black Canyon, located between Hoover Dam and Willow Beach on the northern end of Lake Mohave, is a cold-water area with a year-round water temperature of 54°F. The water temperature, narrow canyon environment, river current, and extremely shallow waters at the upper reaches make it a unique area. There are several hot springs located in Black Canyon, including Arizona Hot Springs, the primary camping area in the canyon. These characteristics make Black Canyon the only area of Lake Mead National Recreation Area where nonmotorized use occurs in significant numbers. The demand for additional nonmotorized launches over the existing

30 launches per day has created a six-month waiting list for [weekend](#) launch permits.

While the Lake Mead National Recreation Area carrying capacity study (appendix B [page 314]) adequately addresses the environmental and social conditions that characterize boating conditions on Lakes Mead and Mohave, it does not sufficiently address the Black Canyon environment. Black Canyon, for the reasons presented above, is more closely aligned to conditions found along the Colorado River in Grand Canyon National Park, where boating capacities are based on parties, with the typical party represented by multiple boats. Under this alternative, the National Park Service proposes to manage boating by parties rather than by individual boats. Using parties as the use indicator, Black Canyon would be managed for 15 parties with three to four nonmotorized boats per party.

[The proposed 100-foot flat-wake zone around the entire lake has been modified in this *Final Environmental Impact Statement* to more closely parallel the state of Nevada standard. The modified preferred alternative now proposes a 200-foot flat-wake area around beaches frequented by bathers, boats at the shoreline, and near people in the water and at the water's edge. In Black Canyon, this may mean that boats need to be at flat-wake speed \(5 mph or less\) within these criteria. The limited width of the Black Canyon would require boats to travel at slower speeds when they encounter beached boats or persons swimming or fishing at the shoreline.](#)

On Lake Mohave, the primitive and semiprimitive areas would include Black Canyon above Willow Beach. In this area, temporal zoning would be applied, providing a range of recreational settings. The area would be managed for a primitive setting two days per week on a year-round basis. Between Labor Day and Memorial Day, the area would be managed for a semiprimitive setting five days per week. During the summer months between Memorial Day and Labor Day, the area would be managed for a rural natural setting with only houseboats, waterskiing, and wakeboarding prohibited. Personal watercraft use would be monitored during this period and restricted if the safety of lake users becomes an issue. This will be determined by reported conflict information and boating incidents. Horsepower restrictions would be in place to implement the semiprimitive zoning, limiting all watercraft to a maximum horsepower of 65. The use of trolling motors is not authorized as part of the management of

Black Canyon during the two-day period when the area is managed for a primitive setting, but concession-operated raft trips from Willow Beach to Hoover Dam would continue to be allowed. The National Park Service will continue to work with the concession-operated raft tours to promote the use of efficient and quiet engine technology. It is expected that during these two days, nonmotorized launches from below Hoover Dam would increase from 30 to 60 permits and would include 30 day-use permits and 30 overnight-camping permits. On the remaining five days, both nonmotorized and motorized vessels (under the 65-horsepower restriction) would be permitted within this zone. The nonmotorized launch permits during this five-day period would increase from 30 to 45 permits.

The 65-horsepower maximum engine size restriction for operation in the Black Canyon area would only be in effect during the days it would be managed as a semiprimitive zone. This engine size is large enough to allow smaller fishing boats to safely access the canyon, but it discourages the fast, loud, and big boats and creates a more quiet and tranquil area that is consistent with the semiprimitive setting. The engine size also limits the size of the wake produced that nonmotorized watercraft would need to negotiate as they descend the canyon. The 65-horsepower engine was selected as the maximum size to address the noise, speed, wake, and mix of boat requirements that would best meet the semiprimitive management objectives. The use of horsepower restrictions was also considered preferable to speed restrictions due to the presence of a current that makes managing for speed difficult.

The area extending from the head of Iceberg Canyon to Grand Canyon National Park would be designated rural natural, and personal watercraft, waterskiing, and wakeboarding would be permitted. This is contingent on Grand Canyon National Park allowing motorized boat traffic to enter the canyon from Lake Mead National Recreation Area. Should the Grand Canyon National Park decide to prohibit boats from entering the canyon from Lake Mead, the area upstream from Paiute Point to the mouth of the Grand Canyon would be zoned semiprimitive.

Enforcement, Boater Education, and Alcohol Use

To address conflicts between boaters and shoreline users and boater-to-boater conflicts, a 200-foot flat-wake zone would be established to provide greater

protection for swimmers and people at the shoreline. It would also provide protection for vessels at the shoreline from the wakes of boats operating in close proximity. Implementation of such a zone would require coordination with the states of Nevada and Arizona, where a change in the respective state's boating laws and regulations would be sought.

Boaters have difficulty understanding the differences between federal and state boating laws, as well as the differences between Nevada and Arizona state boating laws (see "Appendix E: Comparison of Boating Regulations"). Under this alternative, unified boating laws for Lakes Mead and Mohave are proposed, along with a joint regulatory program that includes the states of Nevada and Arizona.

Boating education is a voluntary program in Arizona and a mandatory program for boaters using interstate waters in the state of Nevada. Visitor surveys show that only 20% of Lakes Mead and Mohave boaters have taken a basic seamanship or boating class. Under this alternative, the National Park Service would support mandatory boater education to operate a motorized vessel, including boats and personal watercraft, within Lake Mead National Recreation Area. A long-term program to phase in boater education is proposed that would be similar to programs in place in other states. For Lake Mead National Recreation Area, it is proposed that all boaters born after January 1983 would be required to take a boating class and carry a certification of this class at all times when operating a boat. The boating course would meet the requirements of the National Association of Boating Law Administrators and satisfy the requirements for most states administering boating education programs. The National Park Service would work with the state of Arizona to phase in such a program.

Boating and alcohol use were also raised as an issue the public would like the National Park Service to address. Under this alternative, alcohol consumption while operating a boat would be prohibited. This would require coordination with the states of Nevada and Arizona where a change in the respective state's boating laws and regulations would be sought. Alcohol would continue to be banned in areas, like Gypsum Wash, where it is currently prohibited. High-use areas, high-use shorelines, and problem areas may be designated "alcohol free" if it is deemed by the National Park Service to be in the best interest of the recreating public.

The enforcement goals and objectives of the modified preferred alternative, including the desired recreational settings, personal watercraft use areas, 200-foot flat-wake areas, sanitation, glass and styrofoam containers, and boating education requirements can best be achieved through an active education and information program. The National Park Service believes the more time and effort invested in information and education, the less actual enforcement action is required.

Personal Watercraft Use, Waterskiing, and Wakeboarding

A unit-specific rule would be developed for the continued use of personal watercraft within the recreation area. The use of personal watercraft, waterskiing, and wakeboarding is addressed using the recreational opportunity spectrum classifications. Personal watercraft use, waterskiing, and wakeboarding would be prohibited in the primitive and semiprimitive zones (which compose approximately 5% of the total surface water in the recreation area) and in areas currently restricted due to safety reasons, as identified in alternative A. The proposed restricted areas include the inflow areas of the Muddy and Virgin Rivers on the Overton Arm, in the Virgin Basin along the southern shoreline at the Gypsum Beds, and Bonelli Bay. Personal watercraft use, waterskiing, and wakeboarding would be authorized in the remaining 95% of the waters zoned rural natural, urban natural, and urban park, with the exception of Black Canyon on Lake Mohave.

Aircraft Landings

Except in emergency situations, aircraft landings would only be permitted in rural natural, urban natural, and urban park designated areas. Aircraft would not be permitted to land on the waters designated as semiprimitive or primitive in the Black Canyon area between Willow Beach and Hoover Dam on Lake Mohave and the waters of the Gypsum Beds, Bonelli Bay, Grand Wash, and the inflow areas of the Muddy and Virgin Rivers on Lake Mead.

SANITATION AND LITTER

Under this alternative, all people camping on the lake and at undeveloped lakeshore areas would be required to have a portable toilet to contain human

waste. Portable toilets would be available at each of the park concession areas to ensure public access to these facilities. Improved and more accessible boat pump-out and portable-toilet dump stations located in areas accessible to the boating public would be necessary. The National Park Service would locate pump-out facilities at public launch ramps and would have floating restrooms, portable-toilet dump stations, and boat pump-outs positioned at a minimum of seven locations on Lake Mead and three locations on Lake Mohave. The National Park Service would initiate an education program that would address the importance of proper lakeside sanitation.

The National Park Service would continue to maintain shoreline-based restrooms in the drive-in shoreline areas. However, the number of shoreline restrooms would not be increased significantly over the existing level.

Shoreline litter clean-up and recycling programs are proposed under this alternative. Specific litter cleanup efforts would include the continued practice of having garbage bags available at each of the launch ramps and marinas. An environmental park cleanup program is proposed through a partnership with park concessioners, fuel suppliers, volunteer groups, and the National Park Service. Volunteers would access priority cleanup areas using a houseboat provided by the partnership. A similar program at Glen Canyon National Recreation Area has shown this partnership to be effective in maintaining backcountry beaches.

The issue of broken glass and styrofoam litter on the shoreline and along the roadways would be addressed by prohibiting glass beverage containers and styrofoam within the recreation area. Substitute containers that are recyclable would be more compatible with the recreational setting and Mojave Desert environment that characterizes Lake Mead National Recreation Area.

The proposed restriction on glass containers and styrofoam is based on safety and environmental concerns. Glass containers are not appropriate at Lakes Mead and Mohave, as the number of injuries related to this type of container continues to be an issue. Styrofoam does not break down and can be a problem for wildlife. Based on these concerns, the National Park Service is proposing to eliminate these containers from the park. There is no data to support

any major economic impact to concession operations resulting from this change in containers.

Another initiative to address other solid-waste issues is a recycling program that would include aluminum, cardboard, plastic, and newspaper. This recycling program would be similar to community recycling programs and could reduce solid-waste disposal by 50%.

Enforcement of new programs would begin with an extensive information and education campaign. The National Park Service would provide background information in a variety of media and work with park visitors to facilitate understanding and gain support for this initiative. Once park visitors are considered adequately informed, a phased enforcement program would be implemented and would involve working with park visitors to support the objectives of the program which would, ultimately, be enforced along with other park regulations.

RESOURCE PROTECTION

An important element of this alternative is the protection it would provide for the sensitive resources that are found in the waters or along the shorelines of Lakes Mead and Mohave. These areas are sensitive due to the habitat they provide for fish, bird, and mammal reproduction. Continued productivity is dependent on the protection of this sensitive habitat.

Administrative operations, such as maintenance of buoys and environmental monitoring and patrols, are authorized and not limited under this plan.

Inflow Areas

This alternative would protect the sensitive inflow areas of Lake Mead including the tributaries of the Muddy and Virgin Rivers on the Overton Arm. The area of the confluence of the Muddy River and the lake would be managed as a semiprimitive area (flat-wake speed), and the confluence of the Virgin River and the lake would be managed as a primitive setting allowing only electric trolling motors.

Administrative operations, such as maintenance of buoys and lake blinds, are authorized and not limited under this plan.

Shoreline Enhancement

This alternative would provide for some shoreline enhancement projects, which are identified in the park's *Resource Management Plan*, that address the removal of salt cedar in priority areas, as well as the reestablishment of willows in certain locations along the Lake Mohave shoreline. Adaptive management techniques, such as pruning salt cedar to provide shade for the establishment of other species, may be used to control salt cedar and provide additional beach environment. This and other techniques have been used successfully in the Black Canyon area of Lake Mohave.

Water Quality

The protection of lake water from bacterial and chemical pollutants and suspended solids is an important element of this alternative. The monitoring of water quality within Lake Mead National Recreation Area is currently in accordance with state of Arizona and state of Nevada recreational water quality standards. Bacterial water sampling would continue for high-use areas within the urban park zones. Sampling of the more remote zones of the park would continue on a nonscheduled basis with parkwide sampling completed at least once during the high-visitation period. Ongoing water monitoring programs, mainly associated with the Las Vegas Wash inflow area, the intake facilities at the Southern Nevada Water Authority, and selected high-use coves on Lake Mead, would continue. Studies would also continue at the Virgin River inflow area and various areas of the lake where water clarity is being monitored.

The release of black water into Lakes Mead and Mohave is currently prohibited. Black-water containment systems on vessels must be sealed to prevent discharge. Lake Mead National Recreation Area intends to seek funding for monitoring of pathogens and contaminants associated with both gray- and black-water releases. The National Park Service intends to work with the U.S. Geological Survey to further study the distribution and impact of contaminants associated with personal care products released in gray water. The National Park Service plans to work with the states of Nevada and Arizona for the development of consistent regulations across both states to protect the existing high water quality of Lakes Mead and Mohave. If research and monitoring shows that gray-water discharge from

vessels becomes a threat to exceedance of water quality standards, regulations would be developed to prohibit the activity.

A one-time water sampling, in cooperation with the U.S. Geological Survey, occurred in several high-use areas on Lakes Mead and Mohave in June 1999 and found that gasoline and gasoline additives were present. Under this alternative, a monitoring program would be developed along with recreational water standards for lake management. Specific areas might require temporal or seasonal closures to maintain the high water quality standards for recreation.

Chemical pollutants emitted from carbureted two-stroke engines used in recreational boats and personal watercraft have been reported to discharge as much as 30% of their fuel unburned (CARB 1999, NPS 1999d). These pollutants include gasoline and gasoline additives, which have been found in high-use areas of Lakes Mead and Mohave. Under this alternative, a monitoring program would be developed along with recreational water quality standards for lake management. The EPA regulation requiring the marine industry to improve the efficiency of engines by the year 2006 would be adopted at Lake Mead National Recreation Area in 2012. To protect the drinking water and the aquatic environment at Lake Mead National Recreation Area, after the year 2012, all engines operating on Lakes Mead and Mohave would be required to meet the 2006 EPA emissions standards.

Under this alternative, carbureted two-stroke engines would be phased out over the next 10 years. At this time, there is no plan to accelerate the phase-out schedule. This 10-year timeframe takes into consideration not only the typical life span of personal watercraft but also typical outboard engines. The formula for determining the operating life of personal watercraft was published in the *Federal Register* on October 4, 1996 (EPA 1996a). Based on this formula, the National Park Service expects that by 2012, most boat owners will already be in compliance with the 2006 EPA marine engine standards. The Personal Watercraft Industry Association believes the typical operating life of a personal watercraft rental is 3 years and approximately 5 to 7 years for a privately owned vessel. Therefore, the average operating life of a personal watercraft is 5 to 10 years, depending upon

the source. The 10-year phase-out period for the carbureted two-stroke engine provides a reasonable timeframe for boaters to comply with the management objectives. If, in 2012, park visitors have an outboard engine or personal watercraft that does not meet these strict emissions standards, they would not be able to operate that vessel on Lakes Mead or Mohave.

Boat maintenance within the park is also a source of chemical water pollutants. The National Park Service has prepared a summary of best management practices for these operations within the recreation area. The National Park Service would continue to keep abreast of the technology in this field and provide guidance for all concessioners and individual business permittees, as well as the general public who are involved in boat maintenance, commercial operations, and commercial and private fueling.

Fuel spillage during shoreline refueling operations is a concern. In areas of intense boat and personal watercraft use, park personnel have observed a sheen on the water due to fuel spillage. Polluting or contaminating park waters, including fuel spillage, is a citable offense under 36 CFR 2.14(7). Still, refueling of boats and personal watercraft along the shoreline and in the waters of Lakes Mead and Mohave continues to be a source of chemical water pollution. Increased boater education and the enforcement of applicable regulations could reduce this activity and lead to improved water quality in high-use areas.

The National Park Service would develop a monitoring plan that would include several targeted constituents of gasoline and related degradation products, including some PAH (polycyclic aromatic hydrocarbons). The monitoring plan would focus efforts on high-use areas on Lakes Mead and Mohave. The National Park Service will evaluate the operation of all facilities on Lakes Mead and Mohave in accordance with the modified settlement agreement. Specific locations might require temporal or seasonal closures if monitoring identifies areas of concern not meeting water quality standards. The development of a monitoring plan would be consistent with the interests of local, state, and federal agencies.

Threatened, Endangered, and Sensitive Species**Protection of Razorback Suckers and Bonytail Chub.**

Survey Sites — Surveys for razorback suckers have been conducted since the early 1990s by biologists working with the Native Fish Work Group. Biologists have determined that there are at least nine coves on Lake Mohave that are important for razorback sucker recovery and where spawning activities occur. Surveys on Lake Mead were conducted both by biologists working with the Native Fish Work Group and through the Southern Nevada Water Authority. These surveys resulted in two known locations for razorback spawning activities.

There is less information known about the bonytail chub. Past information has shown that these fish spawn in lower Lake Mohave; however, recent surveys have not shown conclusive evidence that bonytail continue to spawn in the lake. Surveys would continue in an attempt to locate spawning areas for this fish.

Protective Measures — Based on National Park Service boating counts conducted during 1993 to 1994, the average boating use during razorback sucker spawning season is very low. The following table illustrates the use of Cottonwood Basin (zone 3), Six Mile Cove to Catclaw Cove (zone 4), and Catclaw Cove to Fire Mountain Cove (zone 5). Even though the data shown below are not recent, newer surveys have shown that they are very representative of current use.

Month	Zone 3	Zone 4	Zone 5
December	5	3	0
January	12	2	2
February	4	3	0
March	10	4	2
April	48	60	26

In addition, the following table illustrates the use at three of the known spawning sites on Lake Mohave. These data are also based on actual counts that occurred in 1993 and 1994.

Month	Cove #1	Cove #2	Cove #3
December	0	0	0
January	0	2	0
February	0	0	1
March	1	1	0
April	3	2	0

The National Park Service would continue to monitor boating use during the spawning period. If use of known spawning sites increases dramatically, or if the Native Fish Work Group recommends action, the spawning sites would be closed to boating activity during spawning season. Buoys and/or markers would be utilized for closing the areas.

The National Park Service also has concern about the recreational use of areas near the grow-out ponds around Lake Mohave that are utilized for native fish recovery efforts. If scientists working in conjunction with the Native Fish Work Group find that the grow-out ponds are being vandalized, the beaches adjacent to these areas would be closed to visitor use during the grow-out periods.

In addition, information would be provided to the marinas about native fish, and this information would be included with their houseboat and boat rental information. Houseboat users would be encouraged to beach at areas other than known spawning sites.

Currently, Blackbird Point and Echo Bay are the two known razorback sucker spawning areas on Lake Mead. Echo Bay marina is also currently located near a spawning area. While studies have not shown evidence of damaging effects from marina operations on the razorback suckers, there is concern about the potential for major fuel and chemical spills at these marinas.

The National Park Service has identified several protective measures for the fish. On Lake Mead, the back bay of Echo Bay would be closed to boat use during the razorback spawning period between December 1 and May 1. The mooring field would be eliminated from this area, and temporary buoys and signage would be placed on the water, in accordance with National Park Service biologists' recommendations, based on the fluctuating water levels and the location of spawning areas. Press notifications and signage at the marina would include educational information on native fish.

Prior to its temporary relocation, Las Vegas Bay marina was located near Blackbird Point. This area will remain open to motorized vessels; however, it is and will continue to be designated as a flat-wake zone, which should provide some protection from disturbance impacts.

Marina expansion is proposed at Cottonwood Cove on Lake Mohave, and specific compliance would occur during the development concept planning process. The National Park Service would initiate razorback sucker monitoring during the 2002–2003 winter season to determine if razorback suckers are utilizing the shoreline area around Cottonwood Cove and Ski Cove. National Park Service biologists would use SCUBA to survey the proposed expansion site and include this area with annual razorback sucker monitoring activities.

In addition, marina operators would be required to follow the “Best Management Practices, Watercraft and Marina Operations, Dry Boat Storage, and Boat Repair Services,” for Lake Mead National Recreation Area (NPS 1996a).

Protection of Southwestern Willow Flycatchers.

Survey Sites — Surveys for this species have been conducted at Lake Mead National Recreation Area for the last 5 to 6 years by National Park Service and Bureau of Reclamation biologists, and contractors from the San Bernardino County Museum. On Lake Mead, surveys have been conducted along the Virgin and Muddy River inflows, at the Overton Wildlife Management Area, and at the Colorado River Delta at Pearce Ferry. On Lake Mohave, surveys have been conducted at several coves that have suitable habitat.

Known Habitat — Nesting by Southwestern willow flycatchers has been documented in several locations within Lake Mead National Recreation Area. Occupancy of these areas has been variable from year to year due to floods and other habitat disturbances. Willow flycatchers have been observed at survey points along the shorelines of Lake Mohave, an obvious corridor for migration. No nesting has been documented on Lake Mohave, although birds have been found in the area on dates extending beyond the typical migrating season.

Potential Habitat — Defining potential habitat for the Southwestern willow flycatcher at Lake Mead is difficult. The species occurs in riparian habitats with dense plant growth and may nest in native (e.g.,

willow) or exotic (e.g., salt cedar or Russian olive) vegetation. The size and shape of habitat patches used by breeding flycatchers vary considerably, but it is likely that much of the shoreline habitat is too narrow and linear to be used for anything other than migration. The scale of vegetation data in the park’s geographic information system is too coarse to delineate individual areas as being suitable for willow flycatchers. In general, large patches of mature riparian vegetation, either native or exotic, should be managed as potential habitat for the species.

Protective Measures — A monitoring program would be implemented for the Southwestern willow flycatcher, in accordance with U.S. Fish and Wildlife Service protocol, during the breeding season in potential habitat. This includes portions of the shoreline of Lake Mohave and the Muddy, Virgin, and Colorado River inflow areas. If breeding pairs or nesting sites are found during these surveys, the areas would be closed to restrict all recreational use. This would prevent the disturbance from any type of vessel and any type of human disturbance, such as camping. Lake access to these areas would be closed using buoys and markers, and access roads that lead to the sites would temporarily be closed.

Protection of Desert Tortoises.

Survey Information — Survey information for the desert tortoise at Lake Mead National Recreation Area dates back to the early to mid-1990s and comes from a variety of sources. The park has 2 square-mile monitoring plots and 14 square-kilometer monitoring plots that have been used to monitor population trends. In addition, 400 survey transects (each 1.5 miles in length for a total of 600 miles) have been run throughout the park to determine areas of occupancy and relative density. Contractors, cooperators, and other agencies working in the park have also contributed information on the species.

Past Consultations — The park has consulted with the U.S. Fish and Wildlife Service in the past for reconstruction projects on Lakeshore Road and Northshore Road. The park also holds a U.S. Fish and Wildlife Service permit (permit TE-840615-4) authorizing research activities within the park. All research and monitoring activities conducted in association with this permit are outlined in annual reports to the U.S. Fish and Wildlife Service.

Vehicular Mortality — Mortalities of desert tortoise as a result of vehicular traffic certainly occur more

often than they are actually reported. Within the last five years, two tortoises were found hit by vehicles on Lakeshore Road: one was crushed and killed on impact, and another eventually had to be euthanized because of the severity of its injuries. Contractors working on Northshore Road found the remains of a tortoise that appeared to have been hit by a car. Two mortalities are known to have occurred on backcountry roads, and in at least one of these cases, the mortality was attributed to traffic associated with a construction project occurring in the park.

Areas of Concern — Desert tortoises have a patchy distribution at Lake Mead and throughout its range. Most of the park supports low densities of tortoises with a few hot spots of higher densities. Although monitoring plots and sign transects have helped identify areas of concern, it has not been possible to calculate accurate numeric densities for any area in the park. Methodologies for determining tortoise density have been debated for years and are still a major focus of discussion among biologists and land managers.

Developed areas, parking lots, and boat launch areas, whether at Cottonwood Cove, Eldorado Landing, Stewarts Point, or Overton Beach, are located in marginal habitat with low tortoise densities, and management of these facilities poses little threat to the species. Access roads typically run through more suitable habitat, where the chance of tortoise impacts increases. Tortoise density is low near the access road to Stewarts Point. Near the access roads to Cottonwood Cove and Eldorado Landing, tortoise densities are low-to-medium, but are particularly hard to quantify because drought-induced mortality has significantly reduced populations in those areas. Tortoise densities are considered high near Overton Beach.

Protective Measures — Mitigation, based on past consultations with the U.S. Fish and Wildlife Service, including the Lakeshore and Northshore Road projects, is required for all projects within desert tortoise habitat at Lake Mead National Recreation Area. This mitigation includes tortoise education requirements and measures to minimize adverse effects such as habitat loss, degradation, and fragmentation; direct mortality from construction activities; and raven predation on tortoises.

Sensitive Plant Species. Four sensitive plant species, the sticky buckwheat, three-sided milkvetch, Las Vegas bearpoppy, and sticky ringstem occur in sandy

soils along the shoreline of Lake Mead in areas receiving heavy recreational use. In addition, smoke tree and *Trixis californica* (no common name) occur in areas receiving heavy recreational use along Lake Mohave. These populations would be monitored, and where an unacceptable impact was identified from visitor use, such as trampling or cutting, special management steps would be taken to protect this habitat.

Cultural Resources

Both prehistoric and historic resources are known to occur along the shorelines of Lakes Mead and Mohave. These resources have been documented in the developed areas and in a small number of other areas around the lakes. A system to monitor the sites along the shorelines is being developed. The monitoring would continue under this alternative. To ensure protection of these resources, special zones might be applied that would limit recreational activities where sensitive resources were identified.

A number of submerged prehistoric and historic resources have been documented under Lakes Mead and Mohave. These resources would be preserved in compliance with NPS *Management Policies* and objectives.

To protect cultural resources and to comply with the *National Historic Preservation Act*, all proposed projects would be evaluated to determine the area of potential effect. These areas would be inventoried for significant cultural resources, and a determination would be made as to what impact the project would have on the historic qualities of the resources. Through consultation with project designers, affiliate tribal entities, the respective State Historic Preservation Offices, and the Advisory Council on Historic Preservation, a plan would be developed to avoid or mitigate impacts.

PARK OPERATIONS

In addition to the 105 additional positions identified in alternative A that are necessary to effectively manage the recreation area, 10 additional law enforcement officers would be necessary to regulate recreational zoning in urban interface areas, ensure compliance with the sanitation program, and patrol additional developed areas within the recreation area. At least two additional law enforcement officers and

five to six interpreters for each lake would be required to develop and implement a boating safety and education program. Four more interpretive positions would be required to educate the public on the new lakeshore sanitation requirements. Three additional seasonal interpretive rangers would be necessary to provide education on water quality concerns, especially related to refueling activities and fuel spillage, and six more maintenance positions would be needed per lake to install and maintain the additional backcountry toilets. Six more personnel would be required to implement the water monitoring program. A total increase of 156 personnel would be necessary to effectively implement this alternative.

PERMIT REQUIREMENTS NECESSARY TO IMPLEMENT THE MODIFIED PREFERRED ALTERNATIVE

The National Park Service has existing permits from the U.S. Army Corps of Engineers for the maintenance and upkeep of the existing developed areas within Lake Mead National Recreation Area. Coordination would occur between the states of Nevada and Arizona and the U.S. Army Corps of Engineers to address any significant changes to existing conditions and individual projects that would be implemented after the initiation of this *Lake Management Plan*.

ALTERNATIVE D: BASELINE

GENERAL CONCEPT

This alternative emphasizes growth with a corresponding reduction in the variety of recreational opportunities on the lakes. The waters of the recreation area would be managed for concentrated use with a greater percentage designated as urban park under the recreation opportunity spectrum and no areas would be designated as primitive or semiprimitive. With the increase in urban park zoning, there could be an increase in marina and boat launching facilities. There would be limited opportunities for shoreline restoration under this alternative. Table 2 provides a summary of the actions proposed under this alternative, as well as the actions proposed under the other alternatives.

RECREATIONAL OPPORTUNITY ZONING

Under this alternative, Lake Mead National Recreation Area would be managed for the range of recreational opportunities shown in tables 27 and 28 and figure 12.

Under this alternative, a limited range of recreational opportunities would be provided, and an increase in visitation and the number of boats on the water at any one time would be emphasized. With this increase, there would be no areas designated as primitive or semiprimitive. Under this alternative, a boating capacity of 5,800 boats at any one time would be allowed, as established in appendix B (page 314), which is an increase of approximately 1,407 boats over the existing conditions for a typical summer weekend. A total of 3,739 boats at any one time would be allowed for Lake Mead and 2,061 boats for Lake Mohave.

The urban park designation would increase from 20% of the park to 48% and the urban natural zone would increase from 28% of the park to 30%, resulting in over 75% of the park being managed for either urban park or urban natural recreational settings. [In comparison](#), under alternative C (the [modified preferred alternative](#)), 57% of the park would be managed as either urban park or urban natural.

TABLE 27: RANGE OF RECREATIONAL OPPORTUNITIES AT LAKE MEAD UNDER ALTERNATIVE D

Recreation Opportunity Spectrum Class	Surface Acres ¹	Percentage
Primitive	0	0
Semiprimitive	0	0
Rural natural	33,277	25
Urban natural	30,789	24
Urban park	66,232	51
Total	130,298	100

1. Based on a lake elevation of 1,180 feet above mean sea level.

TABLE 28: RANGE OF RECREATIONAL OPPORTUNITIES AT LAKE MOHAVE UNDER ALTERNATIVE D

Recreation Opportunity Spectrum Class	Surface Acres	Percentage
Primitive	0	0
Semiprimitive	0	0
Rural natural	2,094	8
Urban natural	16,109	59
Urban park	9,197	33
Total	27,400	100

The urban park designation would be expanded from the Katherine Landing (zones 1 and 2) and Boulder Beach (zones 10, 11, and 12) areas to include the Cottonwood Cove area (zones 3 [partial] and 4), the upper portion of the Overton Arm of Lake Mead (zones 17 and 18), and the Temple Bar area (zone 20). These areas would be managed for the maximum number of boats under the physical, environmental, and social criteria identified for each zone.

The urban natural zone would be expanded adjacent to the urban park areas to include zones 3 (partial), 6, 8, and 9 on Lake Mohave and zones 16, 19, 21, and 22 on Lake Mead. Rural natural zones would be limited to zones 5 and 7 on Lake Mohave and zones 14, 15, 23, and 24 on Lake Mead.

FACILITIES

A boating education center would be developed under this alternative in the Boulder Beach area. An additional center could be developed near the southern portion of the recreation area to serve visitors to Lake Mohave. This center would be developed outside the recreation area in cooperation with the local communities.

This alternative provides for the largest increase in boating access facilities (as a result of the increase in boating capacity) for Lakes Mead and Mohave. Under this alternative, the additional necessary facilities would be divided between commercial and public lake access facilities. For the purpose of lake access, public launch facilities would include the construction of new launch ramps or the expansion of existing launch ramps. Commercial facilities would include the addition of slips in the marina, the addition of spaces in dry boat storage, and/or the addition of boats in the rental fleet. Tables 29 and 30 show the number of commercial marina services on Lake Mead and Lake Mohave, respectively.

On Lake Mead, this alternative would allow for additional public lake access in the Stewarts Point area of the Overton Arm, which would include adding a paved launch ramp, 250 pull-through parking spaces, a courtesy dock, solar lighting, and a vault toilet at Stewarts Point. The development at Stewarts Point would be similar to the existing facilities at Government Wash. Expansion of commercial facilities could occur at developed areas including Overton Beach, where 100 additional marina slips and 200 single parking spaces would be added; Echo Bay, where 200 additional marina slips, 200 single parking spaces, and 200 pull-through parking spaces would be added; Temple Bar, where 600 additional marina slips, 300 single parking spaces, and 150 additional pull-through parking spaces would be added; and Callville Bay, where the marina size would increase by 200 slips and single parking spaces would increase by 200. Table 31 shows the number of public launch facilities at Lake Mead.

The expansion of facilities at Lake Mead could be accomplished through a combination of commercial facilities (marina slips, dry boat storage, and/or rental fleet). The commercial and public facilities at Lake Mead Marina and Las Vegas Boat Harbor would be capped at the existing level of development. Public launch facilities at Hemenway Wash, Las Vegas Bay,

and Government Wash would also be capped at the existing development levels. Overall, the boating capacity at Lake Mead would increase by 820 boats at any one time, with the majority added to the Overton Arm area (610 boats) and the Temple Bar area (270 boats).

Implementation of this alternative at Lake Mohave would be accomplished by expanding the commercial facilities at Cottonwood Cove and constructing new launch facilities north of the Eldorado Canyon area. The Cottonwood Cove expansion could be accomplished through a combination of the types of commercial facilities described above, including the addition of 350 pull-through parking spaces and 500 marina slips. Table 32 shows the number of public launch facilities at Lake Mohave.

A site in the vicinity of Eldorado Canyon would be considered for development under this alternative if all safety and access requirements were met. Carrying capacity limits would support development in this area, and access roads and utilities are already in place. The potential facilities at Eldorado Canyon would include a public launch ramp and pull-through parking for 200 vehicles. The development of a launch facility at Eldorado Canyon (similar to the Princess Cove facility) would add an additional 200 boats at any one time, bringing the total increase in boating capacity to 650 on Lake Mohave. If an appropriate site were found in the Eldorado Canyon area, engineering and facility design and an additional environmental analysis would be completed prior to any development.

The commercial facilities at Katherine Landing and Willow Beach would remain at the existing level of development.

Recreational fishing programs are actively managed for both Lakes Mead and Mohave. Fish stocking programs are in place for both reservoirs, and shoreline fishing facilities have been constructed at Katherine Landing on Lake Mohave and at Hemenway Point, at the causeway to Pyramid Island, and at Pumphouse Cove on Lake Mead. Additional facilities are proposed for Cottonwood Cove and Willow Beach on Lake Mohave and at Saddle Cove, Government Wash, and Echo Bay on Lake Mead. At these locations, habitat enhancement studies would be conducted to increase the underwater structural habitat that might hold the fish in the stocking areas. Additional sites, beyond those presented in this plan,

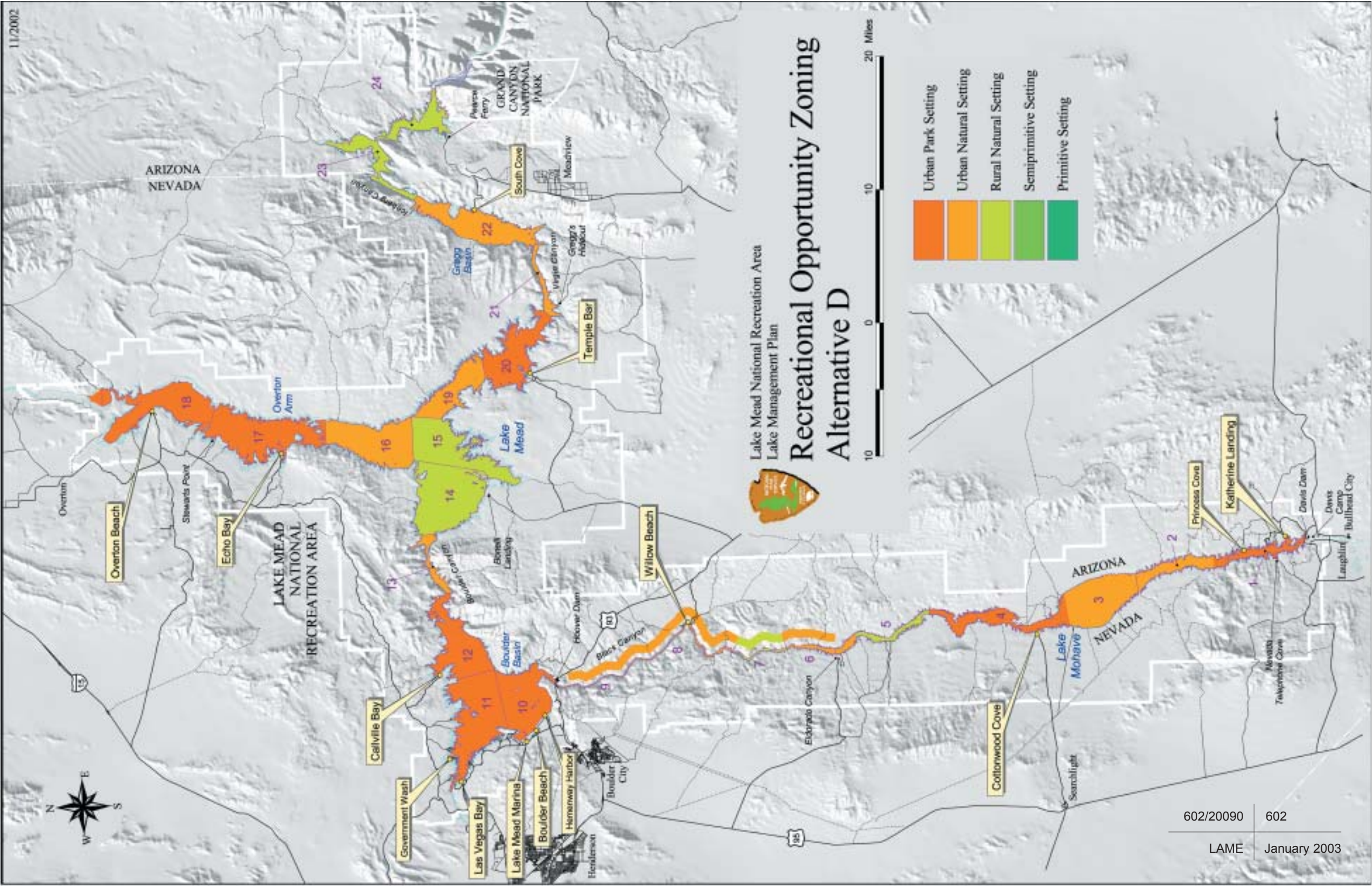


FIGURE 12: RECREATIONAL OPPORTUNITY ZONING UNDER ALTERNATIVE D

TABLE 29: COMMERCIAL MARINA SERVICES AT LAKE MEAD UNDER ALTERNATIVE D

	Overton Beach	Echo Bay	Callville Bay	Las Vegas Boat Harbor	Lake Mead Resort	Temple Bar	Total
Rentals							
Houseboats							
Authorized ¹	0	72	75	0	0	45	192
Existing ²	0	72	65	0	0	0	137
Personal watercraft							
Authorized	20	20	20	20	20	20	120
Existing	12	8	20	18	10	4	72
Other boats							
Authorized ³	12	23	26	47	31	13	152
Existing	7	23	26	47	31	13	147
Wet Storage							
Wet slips							
Authorized	235	560	847	635	755	695	3,727
Existing	140	360	647	635	755	95	2,632
Mooring buoys							
Authorized ⁴	0	0	0	0	0	0	0
Existing	0	19	0	0	0	5	24
Dry Storage							
Dry storage spaces							
Authorized	80	60	120	388	55	200	903
Existing		60	120	388	55	200	903
Parking							
Single spaces							
Authorized	381	417	537	285	145	425	2,190
Existing	181	217	337	285	145	125	1,290
1. Existing number plus the proposed expansion under alternative D. 2. Existing as of September 6, 2001. 3. Rental of other boats could be increased in lieu of the authorized wet slip capacity. 4. Mooring buoys would be phased out after implementation of the proposed expansion under alternative D.							

TABLE 30: COMMERCIAL MARINA SERVICES AT LAKE MOHAVE UNDER ALTERNATIVE D

	Cottonwood Cove	Willow Beach	Katherine Landing	Total
Rentals				
Houseboats				
Authorized ¹	22	0	44	66
Existing ²	22	0	44	66
Personal watercraft				
Authorized	20	0	20	40
Existing	12	0	16	28
Other boats				
Authorized ³	20	18	49	87
Existing	20	18	49	87
Wet Storage				
Wet slips				
Authorized	734	125	824	1,683
Existing	234	0	824	1,058
Mooring buoys				
Authorized ⁴	0	0	0	0
Existing	27	0	0	0
Dry Storage				
Dry storage spaces				
Authorized	300	0	150	450
Existing	300	0	150	450
Parking				
Single spaces				
Authorized	500	200	325	1,025
Existing	153	200	325	678
1. Existing number plus the proposed expansion under alternative D. 2. Existing as of September 6, 2001. 3. Rental of other boats could be increased in lieu of the authorized wet slip capacity. 4. Mooring buoys would be phased out after implementation of the proposed expansion under alternative D.				

TABLE 31: PUBLIC LAUNCH FACILITIES AT LAKE MEAD UNDER ALTERNATIVE D

	Overton Beach	Stewarts Point	Echo Bay	Callville Bay	Government Wash ¹	Las Vegas Bay	Lake Mead Resort	Hemenway Wash	Temple Bar	South Cove	Pearce Ferry ¹
Launch lanes											
Authorized ²	4	4	6	13	8	4	4	4	6	8	0
Existing	4	0	6	13	8	4	4	4	6	8	0
Launch lane capacity ³	192	192	288	576	384	192	192	192	288	384	86
Pull-through parking ⁴											
Authorized	200	250	373	450	150	222	85	175	369	216	50
Existing	200	0	173	333	150	222	85	175	219	116	50
Courtesy dock	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fish-cleaning station	Yes	No	Yes	Yes	No	Yes ⁵	No	Yes	Yes	No	No
<p>Notes:</p> <p>1. Pearce Ferry and Government Wash are closed due to low-water conditions when lake elevations are at 1,175 feet above mean sea level or below.</p> <p>2. Existing number plus the proposed expansion under alternative D. The number of launch lanes at the facilities may be affected due to low-water conditions.</p> <p>3. Based on the number of 12-foot launch lanes multiplied by 8 (number of launches per hour) times 12 (number of daylight hours) divided by 2 (half are launches and half are retrievals).</p> <p>4. Double parking space for vehicle with trailer.</p> <p>5. There are two fish-cleaning stations at Las Vegas Bay.</p>											

TABLE 32: PUBLIC LAUNCH FACILITIES AT LAKE MOHAVE UNDER ALTERNATIVE D

	Eldorado Canyon	Cottonwood Cove	Willow Beach	Princess Cove	North Telephone Cove	Katherine Cove
Launch lanes						
Authorized ¹	4	15	8	8	2	8
Existing	0	15	8	8	2 (gravel)	8
Launch lane capacity ²	192	720	384	384	86	384
Pull-through parking ³						
Authorized	200	577	155	100	100	418
Existing	0	222	155	100	100	418
Courtesy dock	No	Yes	Yes	Yes	No	Yes
Fish cleaning station	No	Yes	Yes	No	No	Yes
<p>1. Existing number plus the proposed expansion under alternative D.</p> <p>2. Based on the number of 12-foot launch lanes multiplied by 8 (number of launches per hour) times 12 (number of daylight hours) divided by 2 (half are launches and half are retrievals).</p> <p>3. Double parking space for vehicle with trailer.</p>						

might be established or enhanced for shoreline fishing in cooperation with the Nevada Division of Wildlife and the Arizona Game and Fish Department.

VISITOR CONFLICT

Visitor conflict is addressed through boating restrictions, shoreline zoning, use of flat-wake areas, restricted alcohol use, unified boating laws, and improved boater education programs.

Shoreline Zoning

Shoreline zoning in the urban areas would be similar to alternative C (the **modified** preferred alternative) with the exception that all zoning would be mandatory and exclusive. Areas zoned for a specific use could only be used for that activity. In addition, a 300-foot **flat-wake** area around the **entire** shoreline of **Lakes Mead and Mohave** would be established throughout the recreation area to reduce conflicts occurring along the shoreline among a variety of user groups. Shoreline zoning for Boulder Beach is illustrated in figure 13 and for Katherine Landing is illustrated in figure 14.

Under this alternative, Kingman Wash in Arizona and Eldorado Canyon in Nevada would be developed as day-use facilities. No overnight camping would be permitted in these areas. Access roads into the areas would be paved, and entrance stations would be established to collect entrance and lake use fees. Picnic and shade ramadas, along with backcountry restrooms, would be constructed in each area. New facilities would be constructed in flood-safe zones within each area. The shoreline would be zoned in such a way in each of these areas to reduce conflict. This would include a flat-wake zone within 300 feet of the shoreline in each area.

Under this alternative, both nonmotorized and motorized users would continue to utilize the Black Canyon area of Lake Mohave from Willow Beach to Hoover Dam, with the exception of existing restrictions prohibiting houseboats, waterskiing, and wakeboarding. Nonmotorized launches from below Hoover Dam would be limited to 30 per day. No permits would be required for overnight camping in the area.

There would be no separate zoning for the use of paddlecraft. Paddlecraft would be required to mix with other boaters throughout the park with no areas being established exclusively for their use. No increase in launches from Hoover Dam would be authorized.

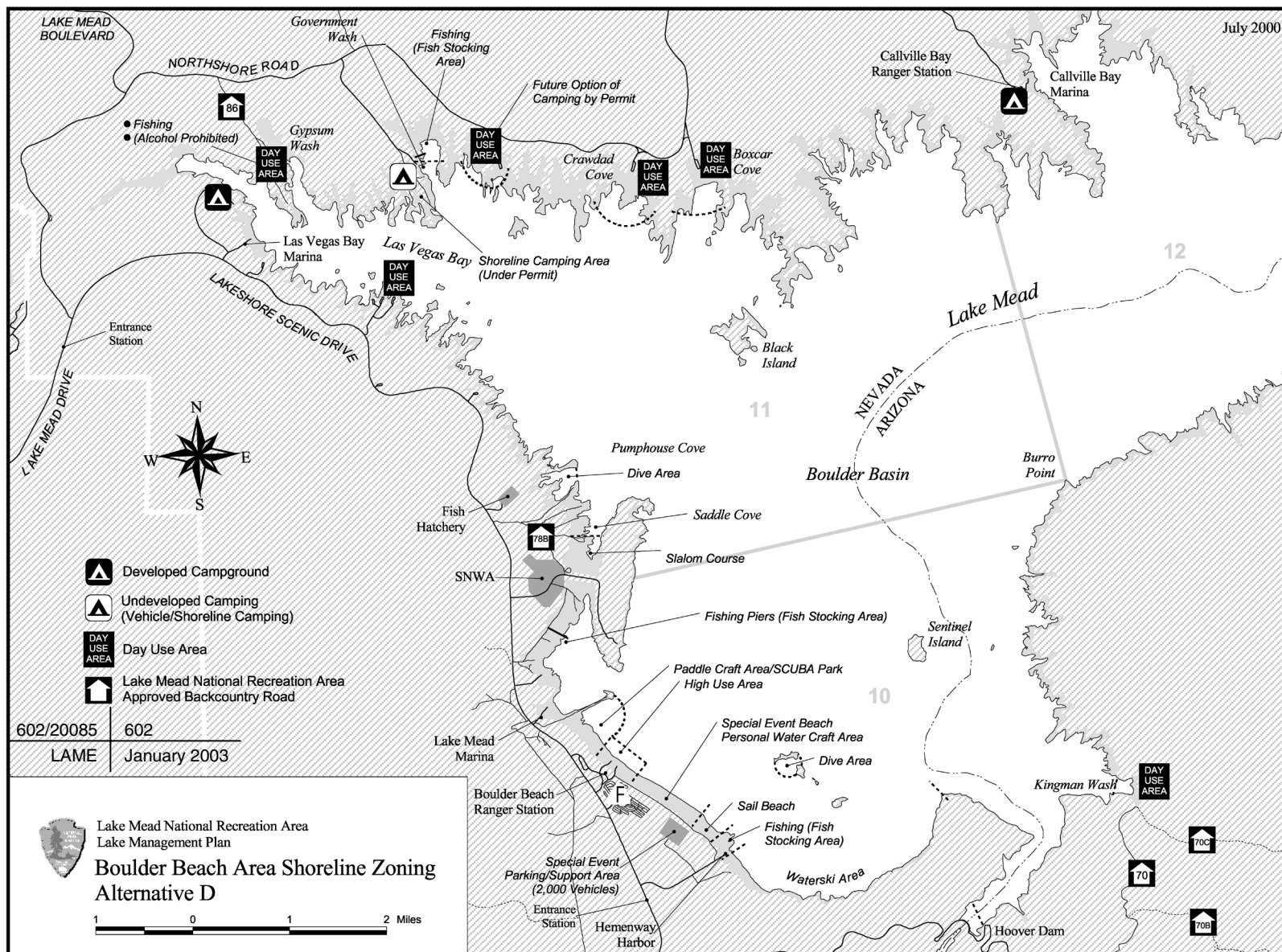


FIGURE 13: BOULDER BEACH ZONING UNDER ALTERNATIVE D (BASELINE)

Alternative D: Baseline

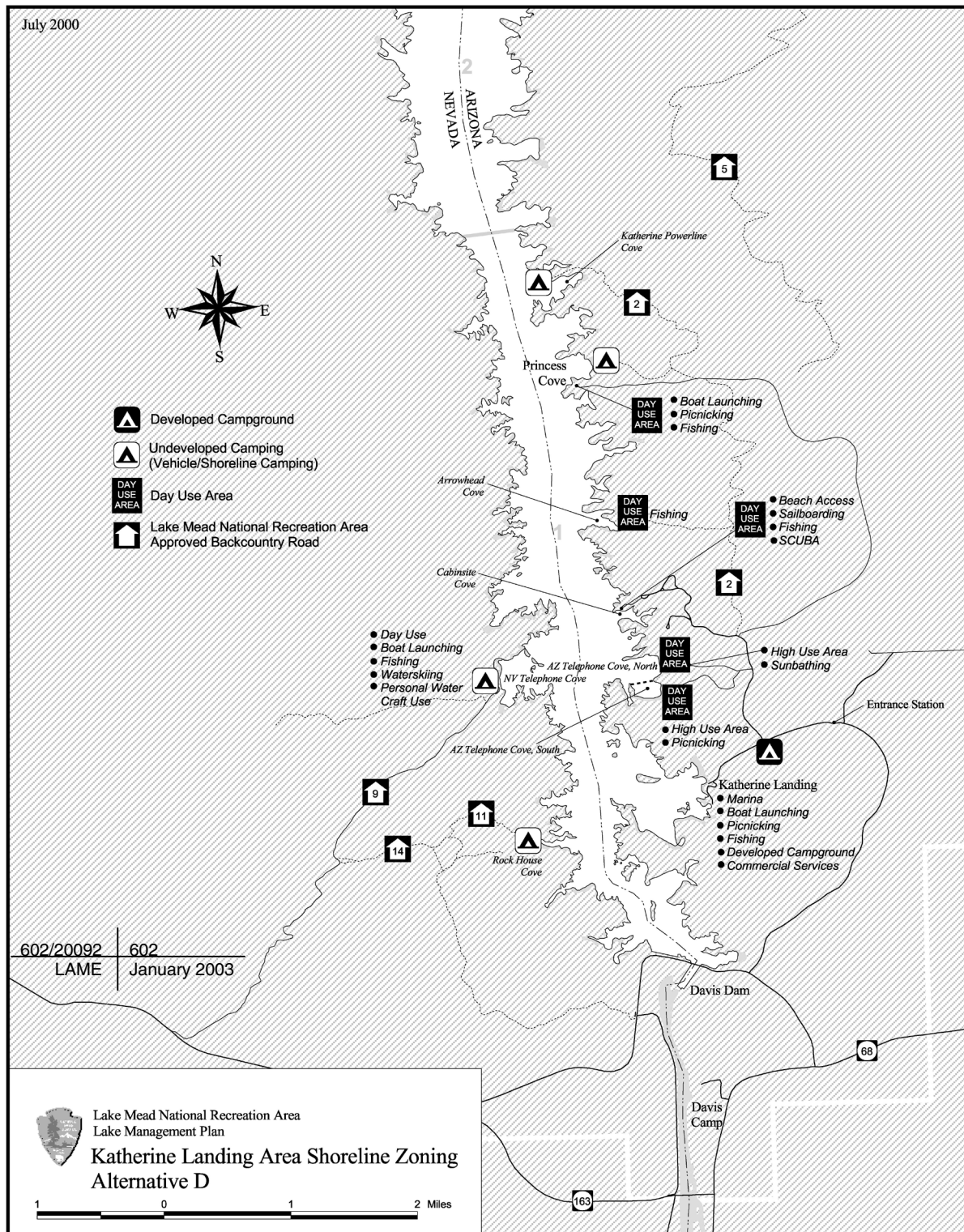


FIGURE 14: KATHERINE LANDING ZONING UNDER ALTERNATIVE D (BASELINE)

Enforcement, Boater Education, and Alcohol Use

Boaters have difficulty understanding the differences between the federal and state boating laws, as well as the differences between Nevada and Arizona state boating laws (appendix E). Unified boating laws for Lakes Mead and Mohave are proposed, along with a joint regulatory program that includes the states of Nevada and Arizona.

Boating education is a voluntary program within the state of Arizona and a requirement for boaters on interstate waters in Nevada. Visitor surveys show that only 20% of Lake Mead and Lake Mohave boaters have taken a basic seamanship or boating class. Under this alternative, boater education would be mandatory to operate a boat within Lake Mead National Recreation Area. A boating education center would be developed in the Boulder Beach area, and a similar center could be developed to serve the southern portion of the recreation area. A long-term program to phase in boater education is proposed that would be similar to the program in place for the operation of personal watercraft in the state of Utah.

For Lake Mead National Recreation Area, it is proposed that all boaters born after January 1983 would be required to take a boating class and carry a certification of this class at all times when operating a boat. The boating course would meet the requirements of the National Association of Boating Law Administrators and satisfy the requirements for most states administering boating education programs. The National Park Service, rather than the states of Nevada and Arizona, would take the lead in implementing the required boater education program. The enforcement of boating law is presently split between the federal and state agencies within Lake Mead National Recreation Area. Under this alternative, the National Park Service would increase its presence to ensure coverage of all use areas on Lakes Mead and Mohave. The National Park Service would develop the patrol and enforcement plans for the lakes and, through special regulation, make all regulations consistent lakewide.

Boating and alcohol use were raised as a safety issue. Under this alternative, the possession of alcohol within the recreation area would be prohibited. This would require coordination with the states of Nevada and Arizona, where a change in the respective state's boating laws and regulations would be sought.

Under this alternative, the National Park Service would promulgate a special regulation to prohibit all motorized vessels that operate at 75 A-weighted decibels or above.

Personal Watercraft Use, Waterskiing, and Wakeboarding

A unit-specific rule would be developed for the continued use of personal watercraft within the recreation area. Implementing the recreational opportunity zoning described under the facilities section would allow the use of personal watercraft throughout the park with no areas being specifically managed for primitive or semiprimitive opportunities. Waterskiing and wakeboarding would also be permitted in all areas except those marked with prohibitive buoys or markers, as identified under alternative A.

Aircraft Landings

Aircraft landings would be permitted on the waters of Lakes Mead and Mohave.

SANITATION AND LITTER

Under this alternative, all boaters and shoreline campers would be required to have a portable toilet to contain human waste. Portable toilets would be available for purchase and rental at each of the park concession areas to ensure public access to these facilities. This proposal would require improved and more accessible boat pump-outs and portable-toilet dump stations located in areas accessible to the boating public. Pump-out facilities would be located at public launch ramps and marinas and would include floating restrooms and portable-toilet dump stations. Floating boat pump-out facilities would be located at a minimum of seven locations on Lake Mead and three locations on Lake Mohave. To implement the portable toilet requirement, the National Park Service proposes to initiate an education program that would address the importance of proper lake sanitation practices.

The National Park Service would continue to maintain shoreline-based restrooms in the drive-in shoreline areas. The number of restrooms would not be increased significantly over the existing levels.

Shoreline litter cleanup and recycling programs are proposed under this alternative. Specific litter cleanup efforts would include the continued practice of having garbage bags available at each of the launch ramps and marinas. An environmental park cleanup program is proposed through a partnership with park concessioners, fuel suppliers, volunteer groups, and the National Park Service. Volunteers would access priority cleanup areas using a houseboat provided by the partnership, while taking advantage of a houseboat vacation.

The issue of broken glass on the shoreline would be addressed by prohibiting all glass containers within the recreation area. All styrofoam would be prohibited within the recreation area.

Another initiative to address solid waste issues is a recycling program that would include aluminum, cardboard, plastic, and newspaper. This recycling program would be similar to community recycling programs and might reduce solid waste disposal by 50%. A key to implementing this program is the convenience to the public. Recyclable items would not have to be sorted; they would just be collected in a single plastic bag provided by the National Park Service at each of the marinas and launch ramps. Contracts for separating and recycling the waste would be the responsibility of the National Park Service.

RESOURCE PROTECTION

Inflow Areas

Under this alternative, the sensitive inflow areas of the park would not receive additional protection through recreational zoning. There would be only limited boating restrictions in place at the inflow areas, and these would be in the form of speed restrictions.

Shoreline Enhancement

No shoreline restoration or enhancement projects would be initiated because the pressure to use the shoreline would be much greater and it would be difficult to implement projects that would require time for establishing vegetation.

Water Quality

Protection of lake water from bacterial and chemical pollutants and suspended solids is an important element of this alternative. The monitoring of water quality is currently in accordance with state of Arizona and state of Nevada recreational water quality standards. Bacterial water sampling would continue for high-use areas within the urban park zones. Sampling of the more remote zones of the park would continue on a nonscheduled basis with parkwide sampling completed at least once during the high-visitation period. Ongoing water monitoring programs, mainly associated with the Las Vegas Wash inflow area, the intake facilities at the Southern Nevada Water Authority, and selected high-use coves on Lake Mead, would continue. Studies would also continue at the Virgin River inflow area and various areas of the lake where water clarity is being monitored.

Chemical pollutants, such as those emitted from carbureted two-stroke engines used in recreational boats, are a concern within Lake Mead National Recreation Area. These pollutants include gasoline and gasoline additives. Under this alternative, a monitoring program would be developed along with recreational water standards for lake management. Specific areas might require temporal or seasonal closures to maintain the high water quality standards for recreational use. The Environmental Protection Agency regulation that prohibits the manufacture and sale of carbureted two-stroke engines by the year 2006 would eventually lead to a reduction of carbureted two-stroke engine use within the recreation area. The first models were available for sale in 1998. [Based on a possible](#) 10-year lifespan of one of these engines, the effect of the regulation would not be realized in the recreation area until after the year 2025.

Boat maintenance is also a source for chemical water pollutants. The National Park Service has prepared a summary of best management practices for these operations within the recreation area. The National Park Service would continue to keep abreast of the technology in this field and provide guidance for all concessioners and individual business permittees, as well as the general public who are involved in boat maintenance.

[Fuel spillage during shoreline refueling operations is a concern. In areas of intense boat and personal watercraft use, park personnel have observed a sheen on the water due to fuel spillage. Polluting or](#)

contaminating park waters, including fuel spillage, is a citable offense under 36 CFR 2.14(7). Still, refueling of boats and personal watercraft along the shoreline and in the waters of Lakes Mead and Mohave continues to be a source of chemical water pollution. Increased boater education and the enforcement of applicable regulations could reduce this activity and lead to improved water quality in high-use areas. In addition, the National Park Service will evaluate the operation of all facilities on Lakes Mead and Mohave in accordance with the modified settlement agreement.

Threatened, Endangered, and Sensitive Species

Threatened and endangered fish species would continue to be monitored and enhancement projects would continue to be implemented with the understanding that there would be an increase in the recreational use of the sensitive species habitat. If impacts were identified, special zoning might be required to provide an adequate level of protection for these species.

Four sensitive plant species, the sticky buckwheat, three-sided milkvetch, Las Vegas bearpoppy, and sticky ringstem, occur in sandy soils along the shoreline of Lake Mead in areas receiving heavy recreational use. In addition, smoke tree and *Trixis californica* (no common name) occur in a heavy-use area along Lake Mohave. These populations would be monitored and where unacceptable impact was identified, special management steps would be taken to protect the habitat. Under this alternative, it is anticipated that with increased use, closures might be necessary.

Cultural Resources

Both prehistoric and historic resources are known to occur along the shorelines of Lakes Mead and Mohave. These resources have been documented in the developed areas and in a small number of other areas around the lakes. A system to monitor the sites along the shorelines is being developed. The monitoring would continue under this alternative. To ensure the protection of these resources, special zones might be applied that would limit recreational activities where sensitive resources were identified.

A number of submerged prehistoric and historic resources have been documented under Lakes Mead and Mohave. These resources would be preserved in

compliance with NPS *Management Policies* and objectives.

To protect cultural resources and to comply with the *National Historic Preservation Act*, all proposed projects would be evaluated to determine the area of potential effect. These areas would be inventoried for significant cultural resources and a determination would be made as to what impact the project would have on the historic qualities of the resources. Through consultation with project designers, affiliate tribal entities, the respective State Historic Preservation Offices, and the Advisory Council on Historic Preservation, a plan would be developed to avoid or mitigate impacts.

PARK OPERATIONS

Overall, the required park staffing levels would be higher than under alternative C (the modified preferred alternative), due to the higher boating densities that would occur under this alternative D. In addition to the 105 deficiencies identified in alternative A, at least 12 more law enforcement positions would be required to implement this alternative. These positions would be necessary to regulate recreational zoning within the urban interface areas and enforce the new restrictions on alcohol use. At least two additional law enforcement officers and five to six interpreters for each lake would be required to develop and implement a boating safety and education program. Four more interpretive positions would be required to educate the public on the new lakeshore sanitation requirements. Three additional seasonal interpretive rangers would be necessary to provide education on water quality concerns, especially related to refueling activities and fuel spillage. More maintenance staff would be required due to the increased upkeep required with increased visitation. In addition to the 35 positions currently deficient in the park maintenance program, at least 6 more full-time positions per lake would be necessary to construct and maintain the sanitation facilities, 10 more full-time positions per lake would be required for general upkeep of facilities, and 6 seasonal positions would be required to implement the water quality monitoring program. A total of 178 employees (73 above the deficient number identified in alternative A) would be required to effectively implement this alternative.

ENVIRONMENTALLY PREFERRED ALTERNATIVE

The environmentally preferred alternative is the alternative that would meet the requirements of section 101 of the *National Environmental Policy Act*. This alternative would satisfy the following requirements:

Fulfill the responsibilities of each generation as trustee of the environment for succeeding generations.

Ensure for all generations safe, healthful, productive, and aesthetically and culturally pleasing surroundings.

Attain the widest range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable or unintended consequences.

Preserve important historic, cultural, and natural aspects of our national heritage, and maintain, wherever possible, an environment that supports diversity and variety of individual choice.

Achieve a balance between population and resource use that will permit high standards of living and a wide sharing of life's amenities, enhance the quality of renewable resources, and approach the maximum attainable recycling of depletable resources.

The no-action alternative, while it eliminates the noise and safety concerns from personal watercraft use, allows for an overall increase in the number of boats within the recreation area. It does not achieve a wide range of beneficial uses of the environment without degradation and risk of health or safety. It does not provide further protection for the sensitive natural and cultural resources. For these reasons, the no-action alternative is not preferred from an environmental perspective.

Alternative D has similar impacts on park resources and visitor use and experience as the no-action alternative. It does not maintain an environment that supports diversity and a variety of individual choices, nor does it achieve a balance between population and resource use that permits a wide sharing of amenities. [Because this alternative does not include a phase-out date for carbureted two-stroke engines or zoning for primitive and semiprimitive uses, it does not provide further protection for natural and cultural resources.](#)

Alternative B does meet recreation area goals with respect to the protection of water and air resources [because the ban of all carbureted two-stroke engines, including personal watercraft, from the recreation area would occur within a year of finalizing this plan.](#) Alternative B would help visitors enjoy a wide range of beneficial uses of the recreation area without degradation and would meet resource management objectives. However, this alternative would not be selected as the environmentally preferred alternative because it would not achieve a balance between population and resource use and a wide sharing of life's amenities since it would limit recreational opportunities for those visitors who have carbureted two-stroke engines.

Alternative C ([modified preferred alternative](#)) has similar impacts on park resources as alternative B. It provides for resource protection by phasing out carbureted two-stroke engines within the recreation area. It protects important cultural and natural resources by zoning sensitive areas for nonmotorized uses. [The 10-year timeframe to phase out the use of carbureted two-stroke engines under this alternative provides a more reasonable timeframe that allows for the widest range of beneficial uses of the environment.](#) In the long-term, it would help visitors enjoy a beneficial use of the park, allowing for access to the park amenities by both motorized and passive recreationists. [Alternatives B and C are](#) designed to meet the National Park Service general prohibition on personal watercraft use for the protection of park resources and values, while providing access to the park by personal watercraft operators.

[The modified](#) alternative C is the environmentally preferable alternative because, overall, it would best meet the requirements of section 101 of the *National Environmental Policy Act*. It would help provide a wide range of beneficial uses without degradation and would improve the safety of the recreation area. This alternative would preserve important natural aspects of our national heritage while providing an environment that supports diversity and a variety of individual choices.

A comparison of the long-term impacts under each of the four alternatives is shown in table 33 at the end of this chapter.

ALTERNATIVES CONSIDERED BUT ELIMINATED FROM FURTHER EVALUATION

Numerous zoning combinations were considered in the development of this *Lake Management Plan*. The four alternatives selected for detailed evaluation are representative of the many alternatives considered in the formulation of this plan. They represent the full spectrum of reasonable options, from the zoning of more primitive and semiprimitive areas to the zoning of more urban park and urban natural settings, plus an alternative that addresses a combination of these options.

The National Park Service believes this *Final Environmental Impact Statement / Lake Management Plan* presents a reasonable range of alternatives that respond to public input and are consistent with and

support the recreation area's enabling legislation, purpose, mission, and management objectives.

The National Park Service believes each of the alternatives considered is attainable, both legally and fiscally. The Park Service considered the status quo with the no-action alternative (alternative A). Transferring management of the park to the respective states was not considered, as that is not consistent with the enabling legislation. Also, the formation of a citizens group for the management of the park is not consistent with NPS *Management Policies*. Citizens were able to provide input through the public participation process as detailed in the "Consultation and Coordination" chapter of this document.

TABLE 33: COMPARISON OF LONG-TERM IMPACTS UNDER EACH ALTERNATIVE

Impact Topic	Alternative A (No Action)	Alternative B	Alternative C (Modified Preferred Alternative)	Alternative D (Baseline)
Air quality	Some beneficial effects	Some beneficial effects	Some beneficial effects	Minor to moderate adverse impacts
Geologic resources and soils	Potentially minor to moderate adverse impacts	No impacts	Potentially negligible adverse impacts	Potentially minor adverse impacts
Water resources, including sensitive aquatic resources	Moderate adverse impacts	Some beneficial effects	Some beneficial effects	Minor to moderate adverse impacts
Vegetation, including shoreline vegetation	Minor adverse impacts	Negligible to minor adverse impacts	Potentially some beneficial effects	Minor adverse impacts
Wildlife and wildlife habitat	Minor to potentially major adverse impacts	Some beneficial effects	Some beneficial effects	Minor to potentially major adverse impacts
Threatened and endangered species	Minor to moderate adverse impacts; potentially beneficial impacts to sensitive habitat	Some beneficial impacts	Some beneficial impacts	Minor to moderate adverse impacts
Cultural resources	No impacts	No impacts	No Impacts	No Impacts
Visitor use, experience, and safety	Moderate to major adverse impacts	Some beneficial effects; potentially moderate adverse impacts	Some beneficial effects	Moderate to major adverse impacts
Soundscapes	Moderate adverse impacts	Slight beneficial effects; moderate adverse impacts	Slight beneficial effects; moderate adverse impacts	Moderate adverse impacts
Socioeconomic resources	Potentially major adverse impacts	Some slight beneficial effects; potentially moderate adverse impacts	Some slight beneficial effects; potentially moderate adverse impacts	Some slight beneficial effects; potentially minor adverse impacts
Park operations	Potentially moderate to major adverse impacts	Potentially moderate adverse impacts	Potentially moderate adverse impacts	Potentially moderate adverse impacts

Affected Environment

INTRODUCTION

This chapter provides a general description of the Lake Mead National Recreation Area lake and lakeshore environment, including visitor facilities and park resources. A complete description of the physical environment of the recreation area can be found within the *Lake Mead National Recreation Area General Management Plan* (NPS 1986), the *Lake Mead National Recreation Area Strategic Plan* (NPS 2001b), and on the Internet at <http://www.nps.gov/lame>.

MANAGEMENT HISTORY OF THE RECREATION AREA

In 1928 the Boulder Dam project (now Hoover Dam) on the Colorado River was authorized through the *Boulder Canyon Project Act* for the purposes of flood control, improvement of navigation and regulation of the Colorado River, storage and delivery of Colorado River waters for reclamation of public lands and other beneficial uses exclusively within the United States, and hydroelectric power production. Construction began in 1931 and was completed in 1936. The National Park Service began managing the recreation facilities and land areas around Lake Mead after the completion of Hoover Dam through an interagency agreement with the Bureau of Reclamation. The management area was expanded in 1947 to include the proposed Lake Mohave, which was completed in 1953. [Davis Dam and Lake Mohave were authorized on April 26, 1941, by the Secretary of the Interior and constructed by U.S. Bureau of Reclamation. Davis Dam provides re-regulation of the Colorado River below Hoover Dam and facilitates water delivery to Mexico, as required by treaty.](#)

Lake Mead National Recreation Area was officially established as a unit of the national park system on October 8, 1964, “for the general purposes of public recreation, benefit, use and in a manner that will preserve, develop, and enhance, so far as practicable, the recreation potential, and in a manner that will preserve the scenic, historic, scientific, and other important features of the area” (PL 88-639). General recreation use was defined within section 4(b) of this legislation and included bathing, boating, camping, and picnicking.

The recreation area boundary was modified in 1975 when the Grand Canyon Expansion Bill (16 U.S.C. § 228a) authorized more than 300,000 acres administered by Lake Mead National Recreation Area be transferred to Grand Canyon National Park. The boundary was further modified in 2000 when the Grand Canyon–Parashant National Monument was established. This national monument is jointly managed by the Bureau of Land Management and the National Park Service and includes 209,297 acres administered by the National Park Service at Lake Mead National Recreation Area, of which 156,473 acres are located on the Shivwits Plateau. The designation of the national monument also includes portions of the northern shoreline of Lake Mead, from the Arizona border at Driftwood Cove, east to the boundary of Grand Canyon National Park.

Lake Mead National Recreation Area contains approximately 1.5 million acres, of which approximately 13% is the lake environment. The major rivers supplying water to the reservoirs are the Colorado, Virgin, and Muddy Rivers. Las Vegas Wash, which flows year-round into Lake Mead, is the outflow for the treated municipal and industrial wastewater from Las Vegas. It provides the second highest inflow into Lake Mead at 155,000 acre-feet annually.

At full pool ([1,221 feet above mean sea level](#)), Lake Mead has a surface area of 157,900 acres with over 700 miles of shoreline. Lake Mohave [at full pool \(647 feet above mean sea level\)](#) has a surface area of 28,260 acres and 150 miles of shoreline. [Minimum pool at Lake Mead results in a surface area of 112,890 acres and a volume of 16,440,000 acre-feet. Surface area at minimum pool at Lake Mohave is 27,455 acres and the volume is 1,460,000 acre-feet.](#) Portions of the recreation area, including a 300-foot zone around the shoreline of both lakes, are jointly administered by the National Park Service for recreation and resource protection and by the Bureau of Reclamation for project purposes [and the security areas at and around Hoover and Davis Dams](#). The Bureau of Reclamation manages the lake levels of both lakes. On Lake Mohave, there is an annual 15-foot water fluctuation zone between the lake elevations of 630 and 645 feet above mean sea level. On Lake Mead, the water fluctuation can be much more significant. In the past 10 years water [surface](#)

elevations have fluctuated between 1,154 and 1,215 feet, a fluctuation of 61 feet.

A temperature gradient zone between the warm, near-surface water and the colder water of the depths is called the thermocline. The thermocline is located at a depth varying from 30 to 55 feet. Below the thermocline the water is cold and low in oxygen and

productivity. These cold, deep waters of the lake are called the hypolimnion.

Lake Mead has four large subbasins, including Boulder, Virgin, Temple, and Gregg's Basin. Four narrow canyons (Black, Boulder, Virgin, and Iceberg) are located between these basins. The shoreline area includes several large bays, including Grand Wash, Las Vegas, and Bonelli.

NATURAL AND CULTURAL RESOURCES

NATURAL RESOURCES

The National Park Service is mandated to preserve the natural resources of the recreation area, including the resources of the stream and lake communities. While the reservoirs were created only after the construction of Hoover and Davis Dams, they provide important aquatic and riparian habitat for a variety of fish, wildlife, and vegetative species.

VEGETATION, AVIFAUNA, AND WILDLIFE

The inflow areas of Lake Mead, including the inflows of the Virgin and Muddy Rivers on the north end of Overton Arm and the Colorado River inflow at Pearce Ferry, are of particular importance. These areas resemble stream riparian and stream communities, with vegetation such as willows, cottonwood, sedges, and rushes. These areas provide excellent habitat to a variety of bird species, including the [Southwestern](#) willow flycatcher and several species of shorebirds, herons, and egrets.

In addition to these inflow areas, portions of the shoreline can provide habitat to other rare or sensitive species. [Four](#) sensitive plant species, the sticky buckwheat, three-sided milkvetch, [Las Vegas bearpoppy](#), and [sticky ringstem](#) can occur in the sandy soils along the shoreline of Lake Mead. However, the majority of the shoreline in the recreation area contains nonnative salt cedar (*Tamarix* spp.), with relatively few areas supporting native vegetation. Fluctuating water levels along the shoreline make restoration of vegetation communities impossible in most situations. However, in selected areas, salt cedar has been removed, and native trees such as willow and cottonwood have been transplanted in an attempt to reestablish the native riparian habitat. These riparian areas provide important habitat to bird species and other wildlife. The Arizona river otter has been reported in these areas, along with beavers, raccoons, and other wildlife species.

With the fluctuation of lake levels, shoreline vegetation can provide cover for fish species once the vegetation is covered with water. The lakes support a number of fish species, including game, nongame, and endemic fish species. Nongame species, such as

carp, and game fish species, including largemouth bass, striped bass, catfish, crappie, and blue gill, inhabit the waters of the reservoirs. Rainbow trout are stocked in selected areas of Lakes Mead and Mohave. Base productivity for each of the reservoirs is low, in part due to the nutrient deficiencies attributable to the creation of Glen Canyon Dam. Game species have become dependent upon a single prey species, the threadfin shad, and rainbow trout are becoming increasingly significant as prey species for striped bass.

THREATENED, ENDANGERED, AND SENSITIVE SPECIES

Two endemic fish species remain in the lakes, despite the alteration of the riverine environment resulting from the construction of the dams. The razorback sucker (*Xyrauchen texanus*) occurs in both lakes, with the largest remaining population in the Colorado River system inhabiting Lake Mohave. The bonytail chub (*Gila elegans*) exists in Lake Mohave. Both of these fish are listed as federally endangered species. Lakes Mead and Mohave have been designated as critical habitat for the razorback sucker, and Lake Mohave has been designated as critical habitat for the bonytail chub. [Surveys for razorback suckers have been conducted since the early 1990s by biologists working with the Native Fish Work Group. The biologists determined that there are at least nine coves on Lake Mohave that are important for razorback sucker recovery and where spawning activities occur. Surveys on Lake Mead were conducted both by biologists working with the Native Fish Work Group and through the Southern Nevada Water Authority. These surveys resulted in two known locations for razorback spawning activities.](#)

[There is less known about the bonytail chub. Past information has shown that these fish spawn in lower Lake Mohave; however, recent surveys have not shown conclusive evidence that bonytail continue to spawn in the lake. Surveys would continue in an attempt to locate spawning areas for this fish.](#)

The humpback chub (*Gila cypha*) and the Colorado squawfish (*Ptychocheilus lucius*) are federally endangered species that could potentially occur within the recreation area, although it is believed

these species no longer exist within the recreation area.

The Virgin River and its 100-year floodplain is proposed critical habitat for the Virgin River chub (*Gila seminuda*) and the woundfin (*Plagopterus argentissimus*), both listed as endangered species. The Virgin River chub is presently found in the Virgin and Moapa (Muddy) Rivers, and the woundfin is found in the Virgin River and could potentially be found within the recreation area.

Several listed or sensitive bird species have been found using the lake and riparian areas. The threatened bald eagle (*Haliaeetus leucocephalus*) is a winter visitor to the recreation area and has been sighted in large trees and cliffs along the shoreline of both lakes.

The endangered Southwestern willow flycatcher (*Empidonax traillii extimus*) has been found along the shoreline areas of Lake Mohave and in the inflow areas of the Virgin and Muddy Rivers. Though no nesting has been confirmed, surveys have shown that flycatchers are in the area during nesting periods and could potentially be using shoreline and riparian areas for nesting. Surveys for this species have been conducted at Lake Mead National Recreation Area for the last five to six years by National Park Service and Bureau of Reclamation biologists, and contractors from the San Bernardino County Museum. On Lake Mead, surveys have been conducted along the Virgin and Muddy River inflows, at the Overton Wildlife Management Area, and at the Lake Mead Delta. On Lake Mohave, surveys have been conducted at several coves that have suitable habitat.

Nesting by willow flycatchers has been documented in several locations within Lake Mead National Recreation Area. Occupancy of these areas has been variable from year-to-year due to floods and other habitat disturbances. Willow flycatchers have been observed at survey points along the shorelines of Lake Mohave, an obvious corridor for migration. No nesting has been documented on Lake Mohave, although birds have been found in the area on dates extending beyond the typical migrating season.

Defining potential habitat for the Southwestern willow flycatcher at Lake Mead is difficult. The species occurs in riparian habitats with dense plant growth and may nest in native (e.g., willow) or exotic (e.g., salt cedar or Russian olive) vegetation. The size

and shape of habitat patches used by breeding flycatchers vary considerably, but it is likely that much of the shoreline habitat is too narrow and linear to be used for anything other than migration. The scale of vegetation data in the park's geographic information system is too coarse to delineate individual areas as being suitable for willow flycatchers. In general, large patches of mature riparian vegetation, either native or exotic, should be managed as potential habitat for the species.

Potential habitat for the endangered Yuma clapper rail (*Rallus longirostris yumanensis*) exists in the recreation area at the inflow areas of the Muddy and Virgin Rivers, at Las Vegas Wash upstream from the recreation area, and in the southern portion of the park near Davis Dam. No confirmed sightings have occurred within the recreation area.

The recreation area provides important habitat for the threatened desert tortoise (*Gopherus agassizii*). Desert tortoise habitat generally occurs in the desert scrub away from the shoreline areas. Survey information for the desert tortoise at Lake Mead National Recreation Area dates back to the early to mid-1990s and comes from a variety of sources. The park has 2 square-mile monitoring plots and 14 square-kilometer monitoring plots, which have been used to monitor population trends. In addition, 400 survey transects (each 1.5 miles in length for a total of 600 miles) have been run throughout the park to determine areas of occupancy and relative density. Contractors, cooperators, and other agencies working in the park have also contributed information on the species.

The park has consulted with the U.S. Fish and Wildlife Service concerning reconstruction projects on Lakeshore and Northshore Roads. The park also holds a U.S. Fish and Wildlife Service permit (permit TE-840615-4) authorizing research activities within the park. All research and monitoring activities conducted in association with this permit are outlined in annual reports to the U.S. Fish and Wildlife Service.

Mortalities of desert tortoise as a result of vehicular traffic certainly occur more often than they are actually reported. Within the last five years, two tortoises were found hit by vehicles on Lakeshore Road: one was crushed and killed on impact, and another eventually had to be euthanized because of the severity of its injuries. Contractors working on Northshore Road found the remains of a tortoise,

which appeared to have been hit by a car. Two mortalities are known to have occurred on backcountry roads, and in at least one of these cases, the mortality was attributed to traffic associated with a construction project occurring in the park.

Desert tortoises have a patchy distribution at Lake Mead and throughout its range. Most of the park supports low densities of tortoises with a few hot spots of higher densities. Although monitoring plots and sign transects have helped identify areas of concern, it has not been possible to calculate accurate numeric densities for any area in the park. Methodologies for determining tortoise density have been debated for years and are still a major focus of discussion among biologists and land managers.

Developed areas, parking lots, and boat launch areas, whether at Cottonwood Cove, Eldorado Landing, Stewarts Point, or Overton Beach, are located in marginal habitat with low tortoise densities, and management of these facilities poses little threat to the species. Access roads typically run through more suitable habitat, where the chance of tortoise impacts increases. Tortoise density is low near the access road to Stewarts Point. Near the access roads to Cottonwood Cove and Eldorado Landing, tortoise densities are low-to-medium, but are particularly hard to quantify because drought-induced mortality has significantly reduced populations in those areas. Tortoise densities are considered high near Overton Beach.

The relict leopard frog (*Rana onca*) is a species of concern in the recreation area. This species was once thought extinct, but has recently been found in certain springs within the recreation area.

There are no listed threatened or endangered plant species in the recreation area, though there are a number of sensitive species that could be found along the shoreline and below high-water levels. The Las Vegas bearpoppy (*Arctomecon californica*), the sticky ringstem (*Anulocaulis leiosolenus*), the three-sided milkvetch (*Astragalus geyeri* var. *triquetrus*), and the sticky buckwheat (*Eriogonum viscidulum*) are sensitive plant species that have been found around Lake Mead below the high-water level.

For a complete listing of federally listed threatened, endangered, or sensitive species that are found or could potentially be found in the recreation area, see “Appendix F: Listing of Threatened and Endangered

Species and Species of Concern and USFWS Biological Opinion.”

CULTURAL RESOURCES

Only a small portion of the recreation area has been archeologically surveyed. Despite the lack of information, significant prehistoric and historic resources are known to occur in the park. More than 1,200 archeological sites exist in the recreation area. Three archeological complexes (the Grand Wash archeological district, the Lost City archeological sites, and the Grapevine Canyon petroglyphs) are listed on the National Register of Historic Places (NRHP).

Historic resources related to settlement, ranching, mining, exploration, and the construction of Hoover Dam exist in the recreation area. More than 55 structures occur on seven sites throughout the recreation area. These structures are on the park’s List of Classified Structures.

The recreation area also contains a variety of traditional cultural areas and sacred sites. When documented, a traditional cultural area or sacred site is referred to as a traditional cultural property (TCP). The Spirit Mountain traditional cultural property, located in the Newberry Mountains, is listed on the National Register of Historic Places. The Goldstrike Canyon/Sugarloaf Mountain traditional cultural property, located in Black Canyon, has been determined eligible for the National Register. During consultation, tribal elders have indicated that tourism, natural processes, and the construction of Hoover Dam have impacted the Goldstrike Canyon/Sugarloaf Mountain traditional cultural property. They consider the area to be in good-to-excellent condition because the impacts, while detrimental, can be remedied through management and traditional cultural practices.

Lake Mead National Recreation Area Protection Division Rangers monitor boat activity along the shorelines of Lakes Mead and Mohave in the vicinity of archeological sites. A standard operating procedure was recently developed for reporting the results of archeological monitoring. There have been no reports of sites being vandalized by boaters since the new reporting procedures were implemented in 2002.

AFFECTED ENVIRONMENT

Two recent projects have inventoried extensive areas of shoreline. The Hualapai Bay survey (Huber 1999) inventoried over 5 miles of shoreline on the Arizona side of Lake Mead and recorded six sites along the shoreline. Huber indicated that boaters left trash and fire rings at some of the sites but did not indicate that the sites were adversely affected by the boaters. In 1999 and 2000, the Western Archeological and

Conservation Center inventoried over 4 miles of shoreline in the Overton Beach area of Lake Mead (report in preparation), and did not locate any sites along the shoreline. Based on these projects, it appears that there are only a small number of sites along the shoreline, and the boaters are not adversely affecting the sites.

PROTECTION OF PARK RESOURCES AND VALUES

The *National Park Service Strategic Plan* (NPS 1996b) and the *Lake Mead National Recreation Area Strategic Plan* (NPS 2001b, parts A and B) outline specific goals related to the protection of natural and cultural resources. The first goal is to protect, restore, or maintain natural and cultural resources and associated values at Lake Mead National Recreation Area and manage these resources within their broader ecosystem or cultural context. This goal provides a framework for answering basic questions about the condition of park resources and enables the park to develop annual and long-term goals and overall performance measures for the restoration of resources, the protection of resources from internal and external threats, and the establishment of strategic scientific needs. Along with these goals and performance measures, the following specific resource topics relate to implementing this lake management plan.

WATER QUALITY

Improving the water quality of the surface and subsurface waters of the recreation area is an important goal of this *Lake Management Plan*. This goal incorporates all activities the park engages in to protect the quality of its surface and subsurface waters.

Water quality within Lakes Mead and Mohave is threatened by external sources, such as Las Vegas Wash and the Virgin and Muddy Rivers, and internal sources, such as park wastewater treatment, human sanitation, and gasoline and oil from boats and personal watercraft. Ultimately, the National Park Service has a “duty” under law to protect the waters of Lakes Mead and Mohave. The highest established standard for water quality in both Nevada and Arizona is for swimming (full body contact). Fishing is an important visitor activity with established water quality standards. The park has adopted these standards as the desired condition for 98% of the park. The standard is set at 98%, rather than the desired future goal of 100%, because the standards from Las Vegas Wash to a point to the north end of the Las Vegas Bay campground do not include swimming or fishing as a beneficial use due to the current conditions.

Lake Mead provides drinking water for the Las Vegas Valley, so protecting the water quality of the lake is important. The water intake that delivers drinking water to Las Vegas Valley is located at an elevation of 1,050 feet above mean sea level, and the lake surface is usually above 1,280 feet, putting the intake at a depth of 130 feet or more.

Park resource managers have worked with the Lake Mead Water Quality Forum to coordinate monitoring, identify issues related to water quality, and seek solutions to the threats to water quality at Lake Mead. Park managers have also worked with the Las Vegas Wash Coordination Committee to develop a Las Vegas Wash comprehensive adaptive management plan with the goal of improving the quality of water entering Lake Mead. Though this effort has focused on discharges from the Las Vegas Valley, it has also led to increased water-related studies on Lake Mead. More information on water quality in Lake Mead and Las Vegas Wash can be found on the Southern Nevada Water Authority’s website (<http://www.snwa.com>).

Reports have been generated within and outside the recreation area related to the continued use of carbureted two-stroke engines. According to some studies, as much as 30% of the fuel used by these engines is discharged unburned into the water (California EPA 1999). As a result, the heavy use of personal watercraft and other conventional two-stroke engines has resulted in measurable water quality degradation in some of the nation’s lakes and reservoirs. Also known as two-stroke engines, these motors intake a mixture of air, gasoline, and oil into the combustion chamber while exhaust gases are being expelled from the combustion chamber. Since the intake and exhaust processes are occurring at the same time, it is unavoidable that some of the unburned fuel mixture will escape with the exhaust. This expulsion of unburned fuel is the reason for the elevated levels of hydrocarbon emissions from carbureted two-stroke engines. Data from one study (not on Lake Mead) of personal watercraft and outboard motorboats show that carbureted personal watercraft emitted 80% of the hydrocarbons, although they only consisted of 33% of the watercraft on the water (California EPA 1998). A 1999 report prepared for the Nevada Division of Wildlife shows that 22% of the primary watercraft engines on Lake Mead were outboard engines (State of Nevada

1999b). However, of the primary watercraft engines, 11% (or 50% of the outboard engines) were **direct-injection** two-stroke or four-stroke engines, which are much cleaner than **carbureted** two-stroke engines. The report also showed that, although **carbureted** two-stroke engines made up only 50% of the outboard engine fleet, they used 70% of the fuel consumed by the outboard group.

Personal watercraft manufacturers are currently in the process of introducing direct-injection engines. The first direct-injection personal watercraft were introduced late in the 1998 model year. It is expected that most manufacturers in the U.S. market will offer a full range of direct-injection outboard and personal watercraft engines by approximately 2002, partly in response to the demands imposed by California and federal regulators. It is expected that under the new federal regulations, a typical marine engine would be 90% cleaner by 2008. These new engines also have concurrent intake and exhaust processes; however, unlike the carbureted two-stroke engines, the intake charge is air only (no fuel is mixed into the intake charge). The fuel is injected directly into the combustion chamber only after the exhaust process has finished, which means no unburned fuel escapes with the exhaust. This design change results in a four-fold decrease in smog-forming pollution in a typical 90-horsepower engine when compared to a conventional two-stroke engine.

The following components of the fuel are discharged into the receiving water: benzene, toluene, ethyl benzene, and xylene (collectively called BTEX). Very few polycyclic aromatic hydrocarbons (PAH) are discharged into the water in small amounts as part of the unburned fuel; many more are discharged as part of the exhaust from engine combustion. All boats discharge PAH through the exhaust. Because of their chemical characteristics, BTEX readily transfers from the water to air, whereas PAH generally do not.

PAH stands for polycyclic aromatic hydrocarbons. PAH, including benzo(a)pyrene, naphthalene, and 1-methyl naphthalene, are released during the combustion of fuel, though some PAH are also found in unburned gasoline. PAH molecules contain two to seven benzene rings. Their environmental fate, persistence, and toxicity are related to this molecular structure and to the number and configuration of attached alkyl groups (such as methyl (CH₃-) or ethyl (CH₃CH₂-) groups). The smaller and lighter (i.e., two- and three-ringed) compounds are generally more water soluble, more biodegradable, and more

volatile. Their solubility makes them more bio-available (and therefore more of a risk) to aquatic life, but their low persistence also reduces exposure times. PAH in unburned (petrogenic) two-stroke fuel mixtures are rare, with the possible exception of naphthalene, acenaphthene, and perhaps others. There are no EPA national recommended water quality criteria (neither acute nor chronic) for PAH.

PAH, as well as other hydrocarbon emissions, will be reduced as new four-stroke and direct-injection engines replace older carbureted two-stroke engines. The phase-out of carbureted two-stroke engines is an important step toward substantially reducing petroleum-related pollutants. The modified preferred alternative goes a step further in restricting the use of carbureted two-stroke engines after 2012.

Water management agencies often selectively draw water from depths below those where concentrations of gasoline compounds are found. Benzene is less dense than water and will float; therefore, the deeper the intake for any water treatment plant, the less chance there is of drawing in benzene-contaminated water and having it enter the drinking water supply. The water intake that delivers drinking water to the Las Vegas Valley is located at a minimum depth of 130 feet. Gasoline compounds have not been detected in the water samples regularly taken near the water intake by staff of the Southern Nevada Water System.

Studies by the U.S. Geological Survey have identified PAH and other gasoline and motorboat emission compounds in surface water samples of both Lakes Mead and Mohave. Components included benzene, di-isopropyl ether, ethane, ether tertbutyl ethyl, ether tertpentyl methyl, ethylbenzene, methyl tertiary butyl ether (MTBE), meta/paraxylene, o-xylene, and toluene. Of the four BTEX compounds, benzene has the strictest standards for human consumption at 5 micrograms per liter (parts per billion). The highest value for benzene recorded from the USGS sampling was 1.25 parts per billion, taken in the Katherine Landing harbor where there is a very high density of vessels entering and leaving. Concentrations of the other three compounds were well below the maximum contaminant levels for drinking water and all other drinking water criteria found in the literature as well. The values in the USGS report were 3 to 4 orders of magnitude below the lowest-observable-effect levels for aquatic life (USGS 1999). Lake Mead has a surface area of approximately 161,000 acres and holds 27 million acre-feet of water when full. Thus, while gasoline

components do enter the lake from current boating use (including carbureted two-stroke engines) and from other sources (such as fuel spills and parking lot runoff), due in part to the volume of the reservoir and the high volatility of many of these compounds, concentrations have remained well below levels that are known to result in detrimental impacts on the aquatic system of Lake Mead or on human health.

AIR QUALITY

The National Park Service previously monitored the visibility at the recreation area through the use of a teleradiometer and camera. This information was used to establish baseline air quality information. The National Park Service is currently monitoring ozone levels within the recreation area to establish new baseline data. Monitoring is conducted during the summer months. In 2001 and 2002 ozone was measured at Northshore, Overton Arm, and Katherine Landing in Arizona. In 2001 the weekly average ozone concentration ranged from 45 to 55 parts per billion (ppb); the maximum weekly average concentrations were 55 to 66 ppb. Data compiled by the National Park Service Air Resources Division (NPS 2002b) show that the ozone levels in the park are within the national standards. The NPS data also show the SUM06 ozone index at 16 to 24 parts per million (ppm)-hours for part of the park and 24 to 32 ppm-hours for part of the park.

Degraded air quality can impact visibility in the region. The recreation area has spectacular vistas and scenic areas around both Lakes Mead and Mohave. Sheer cliffs, colorful rock formations and soils, and distant mountain ranges create dramatic scenes around the lakes. Preserving the air quality is integral to preserving the high quality of the recreational experience.

The Environmental Protection Agency establishes national ambient air quality standards (NAAQS) for a number of air pollutants, called criteria pollutants, that are considered harmful to public health or the environment (see table 34). Primary standards are designed to set limits for the protection of public health. Secondary standards are designed to protect public welfare and visibility, and to prevent damage to animals, vegetation, and buildings. The Clark County Department of Air Quality Management is the regulatory and enforcement agency for air quality in Clark County, Nevada, while air quality in the

remainder of the state, except Washoe County, is under the management of the Nevada Division of Environmental Protection. Air quality in Arizona is regulated by the Arizona Department of Environmental Quality.

Specific geographic areas are classified as either "attainment" or "nonattainment" areas for each pollutant, based upon the comparison of measured data for criteria pollutants with federal and state standards. Lake Mead National Recreation Area is in attainment of the national standards and is designated as a class II air quality area under the *Clean Air Act*. However, the Las Vegas Valley portion of Clark County, adjacent to the recreation area, is classified as a nonattainment area for particulate matter that is less than or equal to 10 microns in diameter (PM₁₀) and for carbon monoxide (CO). At the end of 2001, Clark County had achieved three years of PM₁₀ data within the national standards, and 2002 indicates that the PM₁₀ levels will remain within the standards. Clark County is awaiting approval of the 2001 PM₁₀ State Implementation Plan. When the 2001 plan is approved, the county will request that the Environmental Protection Agency reclassify the area as an attainment area (Clark County 2002). The current (August 2000) carbon monoxide State Implementation Plan demonstrates attainment of the 8-hour CO standard in 2000, 2010, and 2020.

The Environmental Protection Agency has not yet made attainment designations for the 8-hour ozone standard, which was promulgated in 1997, but delayed by litigation in implementation. Preliminary data indicates that Clark County might also not attain the 8-hour ozone standard.

The air quality of Clark County and the Las Vegas Valley is of concern to the Lake Mead National Recreation Area. This is because, although the normal daytime winds are westerly, the nighttime wind direction is reversed, and air is drawn from the higher elevations to the lower valley. Some degradation of the air quality is evident in the Boulder Basin due to the proximity of the Las Vegas Valley. The sources of air pollutants come primarily from outside the park and can concentrate in the park (especially during periods of atmospheric inversion), causing visible haze. The major existing sources of air pollutants within or adjacent to the recreation area include the Mohave generating plant near Laughlin, Nevada; emissions from motor vehicles from the

TABLE 34: NATIONAL AMBIENT AIR QUALITY STANDARDS FOR CRITERIA POLLUTANTS¹

Pollutant	Averaging Time	Primary Standard²	Lake Mead NRA Status³	Secondary Standard	Purpose
Carbon monoxide (CO)	1-hour 8-hour	35 ppm/ (40 mg/m ³) 9 ppm (10 mg/m ³)	Attainment	— —	Prevent high levels of carboxy-hemoglobin
Nitrogen dioxide (NO ₂)	Annual	0.053 ppm (53 ppb)	Attainment	Same as primary	Prevent breathing difficulties, reduce smog and acid rain formation, and improve visibility
Particulate matter (PM ₁₀)	24-hour Annual	150 µg/m ³ 50 µg/m ³	Attainment	Same as primary	Prevent chronic diseases of the respiratory tract and improve visibility
Particulate matter (PM _{2.5})	24-hour Annual	65 µg/m ³ 15 µg/m ³	New standard; no classification	Same as primary	Prevent chronic diseases of the respiratory tract and improve visibility
Ozone (O ₃)	1-hour 8-hour	0.12 ppm (125 ppb) 0.08 ppm (85 ppb)	1-hour - attainment 8-hour – new standard, no classification	Same as primary	Prevent breathing difficulties, eye irritation, and biological effect on sensitive species
Sulfur dioxide (SO ₂)	3-hour 24-hour Annual	0.14 ppm (140 ppb) 0.03 ppm	Attainment	0.50 ppm (500 ppb) — —	Prevent increased respiratory damage, acid rain, and crop damage and improve visibility
Lead (Pb)	Quarterly average	1.5 µg/m ³	Attainment	Same as primary	Prevent impaired production of hemoglobin
<p>1. Source: 40 <i>Code of Federal Regulations</i> 40, part 50, July 1991, "Ambient Air Quality Standards" and also, http://www.epa.gov/airs/criteria.html.</p> <p>2. ppm = parts per million; ppb = parts per billion; mg/m³ = milligrams per cubic meter; µg/m³ = micrograms per cubic meter.</p> <p>3. The Lake Mead National Recreation Area is not in any federal nonattainment area. Therefore, it may be inferred that pollutant concentrations are less than the standard values. No federal attainment designations have been made for 8-hour ozone or PM_{2.5}.</p>					

Las Vegas Valley and other urban areas; gravel and gypsum quarries; fugitive dust from disturbed lands and construction activities; and other power generating plants in the region. Localized impacts on the air quality from fuel odors and smoke from exhaust are apparent around the marina areas and in areas where concentrated boating occurs.

Despite these air quality issues, pollutant concentrations in the Lake Mead National Recreation Area do not exceed national ambient air quality standards for PM₁₀ and CO. Lake Mead management has been in consultation with state and local air quality personnel to coordinate efforts to minimize pollutant emissions and protect air resources. The measures to accelerate implementation of EPA requirements for the phasing out of carbureted two-

stroke marine engines in the recreation area, included in some of the alternatives of the proposed lake management plan, would contribute to the improvement of air quality.

SOUNDSCAPES

Park soundscapes include both natural and human components. The natural soundscape is considered a park resource. Park natural soundscapes include all the naturally occurring sounds in the park, not including any sounds of human origin. At Lake Mead National Recreation Area, the natural soundscape would include such natural sounds as wind in the trees, thunder, quiet, birds calling, rocks falling,

animals moving, streams flowing, and waves on the lake caused by wind.

Human-caused sounds at Lake Mead National Recreation Area include all types of watercraft (including personal watercraft), automobiles, trucks, aircraft, generators, and electronic devices such as boom boxes and horns.

Sound vs. Noise

Sound (in the context of this environmental impact statement) is a physical disturbance in the air created by vibration. Its three primary parameters are amplitude (measured in decibels [dB]), which determines loudness; frequency (measured in Hertz [Hz]), which determines pitch; and duration (measured in elapsed time units such as seconds or hours). Amplitude, frequency, and duration are physical measurements; loudness and pitch are subjective impressions that depend upon the amplitude and frequency of the sound, plus the characteristics of the listener and the listener's environment (Harrison et al. 1980).

Noise is generally defined as unwanted sound. Sound can become noise due to factors such as loudness, pitch, and duration or when it occurs at unwanted times, comes from an unwanted source, interrupts or interferes with a desired activity, is perceived to be inappropriate or a disturbance, or has unwanted content or meaning. One person's sound (for example, music) may be considered noise by another person.

When evaluated against the natural soundscape, which is all the sounds of nature in the absence of any human sound, all human sound is considered "noise." This does not, however, imply that all human sounds are inappropriate or unacceptable. In the park context, such evaluations must consider management guidance such as park purpose, management zoning, resource sensitivity, impacts from the activity, desired future conditions for resources and visitor experiences, other permitted activities, and similar factors.

Sound levels are commonly measured in a logarithmic unit called a decibel. The human ear is not equally sensitive to all sound frequencies, being generally less sensitive to very low and very high frequency sounds; therefore, the A-weighted decibel scale (dBA), which *roughly simulates* the human

ear's response at 40 dB, is often used in impact analyses. A .22-caliber weapon, for example, is rated at 130 decibels and causes pain to the human ear, while a vacuum or automatic dishwasher is rated at 90 decibels and is considered too loud for phone use. A drilling rig at 200 feet is rated at 70 decibels (DOI n.d.).

However, a single decibel level value does not provide much useful information concerning noise impacts in national park contexts, especially when audibility is an important factor as it is here. Single decibel values, such as those given in the examples above, are really *the sum* of many decibel values across a spectrum of sound frequencies. The distribution of sound energy across the frequency spectrum is, in large part, what distinguishes, for example, the sound of a piccolo (almost all high frequencies) from a bass violin (almost all low frequencies), the sound of one personal watercraft from another personal watercraft, and a personal watercraft from other boat types. Also, a single decibel value just gives a measure of the amplitude (which relates to loudness); it says nothing about the frequency (which relates to pitch) and the duration (and other time factors), which are often very important in determining noise impacts.

Noise from Personal Watercraft and Other Watercraft

All motorized watercraft, including personal watercraft, produce noise that may impact park soundscapes and visitor experiences. Literature from groups opposing personal watercraft state that personal watercraft may be more noticeable and, therefore, more of an impact on people than other motorized vessels because of rapid changes in acceleration and direction and jumping into the air, causing rapid increases in the noise level and changes in the sound frequency distribution.

Noise levels emitted from personal watercraft vary from vessel to vessel depending upon many factors. There is no definitive literature describing scientific measurements of personal watercraft noise. Literature from some sources state that all recently manufactured watercraft emit fewer than 80 decibels at 50 feet from the vessel, whereas literature from other sources use attribute levels as high as 102 decibels without specifying distance. None of this literature adequately describes the methodology for collecting the data to determine those levels. Because

of this, the National Park Service contracted noise measurements of personal watercraft and other boat types in 2001 at Glen Canyon National Recreation Area (NPS n.d.). The noise source data from the Glen Canyon study were used in the soundscape analysis for this environmental impact statement, because the Glen Canyon results were not dependent upon or influenced by park geology or other environmental factors. At Glen Canyon, sound measurements were made of a number of boats and personal watercraft as they passed by a microphone mounted above the front of an instrumented boat. Controlled pass-by measurements of three personal watercraft and one motorboat were conducted at several different speeds. Many boats and personal watercraft were also randomly measured. In all cases, a radar gun was used to determine speed and a laser range finder was used for distance. After normalizing measurements to a common distance, maximum sound levels were computed both for 15 meters and for 25 meters, the distance at which NPS watercraft noise emission regulations apply. Analysis of this data indicates maximum noise levels for personal watercraft at 82 feet ranged from approximately 67 to 76 A-weighted decibels. Maximum levels at 82 feet for other motorboat types were measured during that study and ranged from approximately 65 to 86 A-weighted decibels.

Regulations for boating and water use activities established by the National Park Service prohibit vessels from operating at more than 82 decibels measured at 82 feet from the vessel (36 CFR 3.7). A few of the boats were measured during the 2001 study at greater than 82 decibels and appear to have violated that regulation. None of the personal watercraft were operating above 82 decibels during the pass-by measurements in the study.

The state of Nevada boating noise standards prohibit noise from all motorized vessels at 75 A-weighted decibels measured at the shoreline, independent of speed or distance. State of Nevada and state of Arizona regulations prohibit noise from vessels at 86 A-weighted decibels and above at a distance of 50 feet or more. The Nevada 75-decibel limit must be measured in accordance with the Society of Automotive Engineers (SAE) standard SAE J1970, *Shoreline Sound Level Measurement Procedures*.

While personal watercraft most likely comply with noise standards and, while technology improvements will likely reduce noise levels, the personal watercraft industry recognizes that operator behavior

(such as wake jumping, rapid changes in speed and/or direction, revving the engine) sometimes causes conflicts and advocates increased education and law enforcement.

Influence of Watercraft on Park Soundscapes

On an average day between May and September, there can be more than 4,000 boats on Lakes Mead and Mohave at any one time, and at peak use, there can be more than 5,000 boats at any one time. Personal watercraft constitute 35% of the boats on the water at any one time. Between October and April, fewer recreationists are on the lakes and the number of boats drops dramatically, with personal watercraft composing 14% of the boats on the lake at any one time. Clearly, the noise impacts from personal watercraft and other vessels at Lakes Mead and Mohave are greatest in the summer high-use season and are greatly diminished during the cooler seven months of the year.

Boat use is not uniform over the 157,900 acres of Lake Mead and 28,260 acres of Lake Mohave. Boat use, including personal watercraft use, tends to concentrate in high-use and developed areas, including North and South Telephone Coves and Nevada Telephone Cove on Lake Mohave and Government Wash, Boulder Beach, Sandy Cove and Sandy Point, Hamblin Bay, and Rufus Bay on Lake Mead, with transit between those areas being the primary use in other parts of the lake. Visitors tend to concentrate in these urban park and urban natural areas.

During high-use periods, the sound of boats can be continuous in popular parts of the recreation area. Boat noise is noticeable in the natural zone areas near the lake during periods of high boating activity, but there are extended periods when boating noise is not noticeable. Currently, there are no areas where motorized boating is prohibited, so there are no existing areas on the lake where visitors can go to be sure of escaping boating-related sounds.

Boat noise can be characterized by the type of boat. There are a number of large boats that are powered by multiple inboard or outboard engines and are capable of operating at high speeds. When operating at high speeds, the sound is noticeable to the point that it disrupts normal conversation some distance from the boats, but these periods are generally of limited duration. These boats have the option of running the exhaust through the transom or through

the water. When the exhaust is run through the transom, there is no muffler system, and boats operated in this fashion are reported to produce noise exceeding 100 decibels (noted by Park Service rangers). Since this is far above the NPS regulation limit of 82 decibels at 82 feet, such boats are prohibited from operating on the lake if they choose to run the exhaust through the transom. These vessels are currently attracting complaints from shoreline visitors and other boaters.

There is also the noise associated with personal watercraft powered by two-stroke engines. These craft typically have a higher-pitched engine sound, and because the exhaust is emitted beneath the vessels, there are times when the pitch varies as the bottom of the craft is exposed. This occurs during turns, jumps over the wake of other boats, or as the craft bounces on the water. The changes in pitch can be annoying to some visitors but are within the federal and state noise standards described above.

Manufacturers of personal watercraft are aware of public concerns related to the noise of personal watercraft operation. Steps are currently being taken to reduce the noise by using more rubber in construction and eliminating vibrations. It is anticipated the personal watercraft manufacturers will continue to reduce the noise associated with personal watercraft use.

As new, more enforceable noise regulations are implemented and as the use of quieter personal watercraft and other boats becomes widespread, it is anticipated the overall soundscape would be less affected by boat noise over time. Eventually older, less-efficient two-stroke engines would be replaced by newer, more-efficient and quieter models. Although the older models did meet state and federal noise standards, the newer direct-injection two-stroke engines (and four-stroke engines) have been reported to be quieter than the older models.

Influence of Other Human Noise Sources on Park Soundscapes

Human-caused sounds at Lake Mead National Recreation Area, other than watercraft, include automobiles, trucks, aircraft, generators, and electronic devices such as boom boxes and horns. With the exception of aircraft, these sources tend to be concentrated in developed areas zoned appropriately for such mechanical noise sources. Noise from these sources tends to concentrate in the

developed zones, not traveling far into more natural areas of the park.

Aircraft, on the other hand, are not affected by park zoning. They can and do travel over the entire national recreation area and are often the only human noise source in the more remote areas of the national recreation area. [Sight-seeing air tours destined for the Grand Canyon, as authorized under Title VIII of the National Parks Air Tour Management Act of 2000 \(14 CFR part 136, P.L. 106-181\), fly over Lake Mead Recreation Area. These flights also contribute to noise levels.](#)

Visitor Responses to Personal Watercraft Noise

As with all park resources, the opportunity to experience the natural soundscape is part of the visitor experience. The park's natural soundscape contributes to a positive visitor experience and is a direct or indirect component of why many people visit the national recreation area.

Personal watercraft generate noise that varies in pitch and frequency due to the nature of their construction and use. The two-stroke engines are often used at high speeds, and the crafts bounce along the top of the water such that the motor discharges noise below and above the water surface. Such irregular noise may be more noticeable or annoying to some people than that of a standard motorboat that is cruising along the shoreline, even though the maximum noise levels may be similar for the two watercraft. Additionally, visitors who expect to experience natural soundscapes, solitude, or tranquility may consider the irregular noise of personal watercraft more annoying than a more consistent noise, especially if the craft is operating in one location for extended periods of time.

Long-Term Soundscape Planning

[The NPS Director's Order 47 \(NPS 2000b\) requires a separate soundscape management plan in cases where the urgency or complexity of a noise issue is such that soundscape preservation and noise management cannot be addressed by general management plans or other park implementation plans. The park is in the initial discussions concerning the development of a long-term soundscape management plan.](#)

RECREATIONAL USE OF THE LAKES

Lake Mead National Recreation Area is considered one of the premier water-based recreation areas in the nation. Providing water-based recreational opportunities, while protecting the park resources, is an important component of the *General Management Plan* (NPS 1986) and the *Lake Mead National Recreation Area Strategic Plan* (2001b). There are six marinas and nine paved launch ramps on Lake Mead and three marinas and four paved launch ramps on Lake Mohave. These marinas include Lake Mead, Las Vegas Boat Harbor, Callville Bay, Echo Bay, Overton Beach, and Temple Bar on Lake Mead, and Willow Beach, Cottonwood Cove, and Katherine Landing on Lake Mohave. The public boat ramps are located at Hemenway, Las Vegas Bay, Government Wash, and South Cove on Lake Mead and Princess Cove on Lake Mohave. A variety of services are provided at the marina areas, including boat rentals, marina slips, dry boat storage, restaurants, campgrounds, and lodging facilities (see “Appendix A: Commercial Services Plan”).

Many of the 9 to 10 million yearly visitors to the recreation area are involved in water-based recreational activities between May and September, which are supported at the marina and launch ramp areas. These consist of motorboating, houseboating, sailboarding and sailing, canoeing, kayaking, rafting, waterskiing, wakeboarding, fishing, swimming, SCUBA, use of personal watercraft, picnicking, boat touring, nature study, and camping along the lakeshore. Recreationists also participate in land-based activities, such as driving tours, hiking, and camping in NPS-managed or concession-operated campgrounds.

The Overton Wildlife Management Area is located on the very northern portion of the Overton Arm of Lake Mead and is managed under a cooperative agreement with the Nevada Division of Wildlife. The portion of the Overton Wildlife Management Area that contains the Muddy River confluence with Lake Mead is currently zoned for flat-wake speed during those periods/days when hunting is authorized.

An analysis of recreational use of Lake Mead National Recreation Area was conducted between Memorial Day 1993 and Labor Day 1994 (Graefe and Holland 1997). This study established a baseline inventory of physical, biological, and social factors affecting the quality of the recreational experience at

the recreation area. A component of this study involved aerial and visitor use surveys to determine what recreational activities were occurring at specific locations within the recreation area and the use levels at these locations. The NPS visitor use survey was developed in consultation with Dr. Alan Graefe of Pennsylvania State University. The initial survey was reviewed by a technical advisory committee comprised of Jerry Vaske of Colorado State University, Dick Crysdale with the Bureau of Reclamation, Ray Murray with the National Park Service, and Laura Loomis with the National Parks and Conservation Association. It involved over 3,000 visitor interviews that were conducted in the park at variety of locations, including the launch ramps and marinas, and in all 24 zones of the lakes. In addition, the National Park Service received over 1,500 completed survey booklets providing visitor comments detailing their experiences on Lakes Mead and Mohave.

A second visitor use survey was conducted by the Nevada Division of Wildlife in 1998. This survey involved approximately 800 visitors to Lake Mead National Recreation Area.

The surveys were primarily designed to identify issues to be addressed in this planning process and to help set the social carrying capacity for the different recreational opportunity settings. The design was developed under contract with Pennsylvania State University using a scientifically valid methodology that is explained in a 1997 report titled, *An Analysis of Recreation Use and Associated Impacts at Lake Mead National Recreation Area* (Graefe and Holland 1997). These data were used in the carrying capacity analysis to establish maximum boating capacity for the variety of recreational settings ranging from primitive to urban (see “Figure 15: Recreational Opportunity Zoning, Existing Condition — 2002”). The maximum boating capacities were established for the urban zones at those boating levels where 50% of the public said the number of boats on the water decreased their enjoyment. The associated study provided park management with information on usage levels; the numbers and distribution of boaters and physical and environmental parameters; visitors, including visitor profiles, types of use, and visitor satisfaction; recreational impacts; and a lake use analysis. A summary of this study is found in

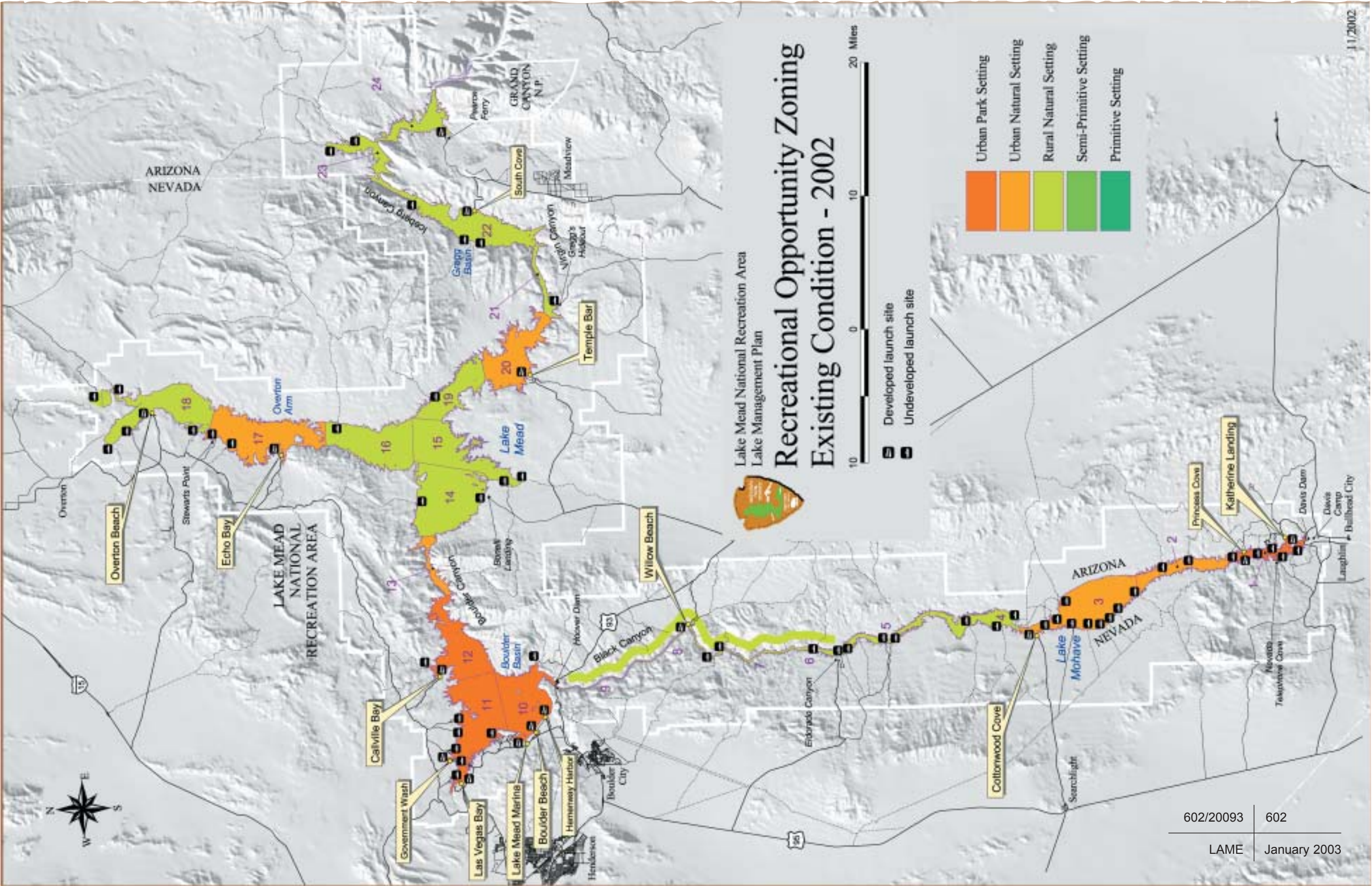


FIGURE 15: RECREATIONAL OPPORTUNITY ZONING EXISTING CONDITION-2002

appendix B. This study helped park managers determine where and what types of recreational use is occurring on Lakes Mead and Mohave.

This study showed that the Boulder Basin of Lake Mead and the Katherine area of Lake Mohave are consistently the two busiest developed areas in the recreation area. Lake Mead Marina and Lake Mohave Marina at Katherine Landing are the two largest developed areas in the recreation area in terms of existing marina slips (see tables 35 and 36). Nearly 67% of boaters access Lake Mohave at Katherine Landing, and 26% of boaters access Lake Mead at Callville Bay.

In addition to the developed areas, there are a number of coves that provide highly desirable recreation settings. North and South Telephone Coves and Nevada Telephone Cove on Lake Mohave, and Government Wash, Boulder Beach, Sandy Cove and Sandy Point, Hamblin Bay, and Rufus Bay on Lake Mead had the highest reported usage during the summer months according to the aerial surveys.

Runabouts (defined as less than 24 feet in length) were the most common type of boat recorded in the study, accounting for 50% of all boats on the lakes. Personal watercraft were the next most common type of vessel in the recreation area, accounting for 30% of the boats reported by respondents and observed in the aerial surveys. More personal watercraft were recorded on Lake Mohave (35% of all boats) than on Lake Mead (25% of all boats).

Recreational watercraft usage on Lakes Mead and Mohave was measured for the summer of 1998 in a study conducted for the State of Nevada Division of Wildlife by Hagler Bailly, Inc. (State of Nevada 1999b). Only access points in the state of Nevada were included in the study. The objectives of this study were to measure watercraft and fuel usage, collect data on public opinion and public support for key recreational boating issues and programs, and determine the characteristics of the boating population. This study provided data on primary water-related activities, types of watercraft used, watercraft ownership, watercraft engines in use, and the amount of fuel used (see tables 37, 38, 39, 40, and 41). The study also provided a means to document the opinion of a representative sample of Nevada-registered boat owners on a number of different recreational boating issues and programs. For example, questions related to noise and safety

issues concerning the use of personal watercraft, boater safety education, safety concerns, and alcohol use were included in the study. The results are based on intercept survey data for Memorial Day weekend through Labor Day weekend in 1998.

Additional visitor surveys have been completed for Lakes Mead and Mohave by various authors in 1993–1994, 1997, 1998, 1999, and 2000, and the National Park Service conducts annual boat inventories. The Hagler Bailly report (State of Nevada 1999b) also provided information on the visitor perception of law enforcement, boating safety, problems observed, and boater education. The data was obtained through intercept survey responses of boaters and mail survey responses of Nevada-registered boat owners. Attitudes about the number of law enforcement patrols was the subject of one survey question. This information was compiled on a statewide sample and is not lake specific. Overall, the majority of the respondents (59%) felt the number of law enforcement patrols was about right, while 38% felt the number of patrols was not enough. About half of all respondents felt more patrols were needed on weekends (49%) and holidays (53%). Nevada boaters were equally divided on the issue of enforcing alcohol consumption regulations. Out of 290 respondents, 44% felt there was not enough enforcement and 51% felt the amount of enforcement was adequate.

About half the boaters on Lakes Mead and Mohave observed one or more boating safety problems or violations. Wake jumping (primarily by personal watercraft users) was the most frequently cited problem on both lakes (approximately 40%), followed by high wakes (30%), failure to yield the right-of-way (28%), and excessive speed (27%).

The study showed that 51% of boaters on Lake Mead have taken one or more formal boating safety courses, while only 32% of boaters on Lake Mohave have taken a similar course. Overall, the majority of Nevada-registered boat owners have not taken a formal safety course (68%). Approximately 64% of Nevada-registered boat owners felt that more formal boating safety education is needed and that safety courses should be required for certain groups of users, including those boaters cited for a violation or causing an accident and persons less than 17 years of age who operate a vessel in excess of 15 horsepower.

TABLE 35: SUMMARY OF EXISTING WATER RECREATION FACILITIES AT LAKE MEAD

	Callville Bay	Echo Bay	Lake Mead Marina	Lakeshore Trailer Village	Overton Beach	Temple Bar	Las Vegas Boat Harbor	Total
Open slips	374	233	759	—	0	112	554	2,032
Covered slips	273	146	0	—	135	0	81	635
Total	647	379	759	—	135	112	635	2,667
Moorings	0	21	0	—	10	12	0	43
Dry storage spaces	120	60	150	133	40	200	388	1,091
Boat rentals								
Ski/patio/fishing	27	23	41	—	1	12	47	151
Houseboats	59	71	0	—	0	0	0	130
Personal watercraft	20	8	10	—	10	2	18	68
Total	106	102	51	—	11	14	65	349

TABLE 36: SUMMARY OF EXISTING WATER RECREATION FACILITIES AT LAKE MOHAVE

	Willow Beach	Cottonwood Cove	Lake Mohave	Total
Open slips	36	234	824	1,094
Covered slips	0	16	0	16
Total	36	250	824	1,110
Moorings	0	25	0	25
Dry storage spaces	0	300	200	500
Boat Rentals				
Ski/patio/fishing	15	21	56	92
Houseboats	0	17	45	62
Personal watercraft	0	12	12	24
Total	15	50	113	178

TABLE 37: PRIMARY ACTIVITY BY LAKE

Reported Primary Boating Activity ¹	Lake Mead ² (%)	Lake Mohave ³ (%)
Cruising/sailing	41.4	31.4
Fishing	14.2	19.8
Waterskiing	16.9	11.6
Personal watercraft usage	17.5	31.4
Swimming	6.7	4.1
Other	3.3	1.7

1. Intercept survey (State of Nevada 1999b).
 2. Sample size = 625.
 3. Sample size = 96.

TABLE 38: PRIMARY WATERCRAFT TYPE BY LAKE

Reported Primary Watercraft Used ¹	Lake Mead ² (%)	Lake Mohave ³ (%)
Runabout/cruiser	57.1	42.1
Bass boat	6.1	8.3
Jet-drive boat	6.8	8.3
Personal watercraft	16.5	36.4
Houseboat	5.7	0.8
Pontoon boat	3.8	4.1
Sailboat	2.6	0.0
Rowboat/canoe/kayak	0.1	0.0
Inflatable boat/raft	0.1	0.0
Other/don't know	1.1	0.0

1. Intercept survey (State of Nevada 1999b).
 2. Sample size = 625.
 3. Sample size = 96.

TABLE 39: PRIMARY WATERCRAFT ENGINE AT LAKE MEAD¹

Reported Primary Watercraft Engine ²	Lake Mead ³ (%)
Outboard 2-stroke, carbureted	9
Outboard 2-stroke, direct-injection	6
Outboard, 4-stroke	5
Unknown outboard	2
Inboard/outboard	36
Inboard	23
Jet	16
Other/don't know	3
Electric	0
No Motor	0.4

1. Lake Mohave data are not shown because data included the area below Davis Dam on the Colorado River.
 2. Intercept survey (State of Nevada 1999b).
 3. Sample size = 625.

TABLE 40: WATERCRAFT OWNERSHIP BY LAKE

Reported Ownership of Primary Watercraft Used ¹	Lake Mead ² (%)	Lake Mohave ³ (%)
Owned by respondent	93.7	86
Rented by respondent	2.2	6.6
Borrowed or using friend's boat	3.8	7.4
Other	0.3	0.0

1. Intercept survey (State of Nevada 1999b).
 2. Sample size = 625.
 3. Sample size = 96.

**TABLE 41: ESTIMATED NUMBER OF BOATING HOURS AND FUEL USAGE FOR
MOTORIZED WATERCRAFT DURING THE 1998 BOATING SEASON¹**

Type of Watercraft Engine	Percentage of All Boating Trips	Number of Boating Trips	Total Usage Hours	Engine Hours	Gallons of Fuel Used
<30 horsepower outboard, 2-stroke, carbureted	1.8	2,982	13,846	4,392	16,754
30+ horsepower outboard, 2-stroke, carbureted	4.3	7,047	38,829	18,207	60,573
Outboard gas, 4-stroke or direct-injection	9.3	15,373	65,553	44,978	158,638
Inboard/outboard gas, 4-stroke	39.0	64,155	371,881	350,213	1,506,118
Inboard gas, 4-stroke	13.3	21,961	122,263	57,595	438,924
Inboard jet gas, 4-stroke	3.0	4,896	26,320	19,530	70,801
Outboard/auxiliary sail	1.6	2,711	20,010	9,790	5,603
Personal watercraft gas, 2-stroke	24	39,447	170,009	96,474	90,334
Personal watercraft gas, 4-stroke or direct-injection	3.6	5,991	30,028	16,016	13,719
1. Lake Mead boat ramp / marina; sample from Nevada access sites.					

Boating accidents are reported by the state of Arizona and the state of Nevada in their respective annual reports. Arizona has approximately 160,000 boats registered in the state while Nevada has 60,000 boats. Mohave County, Arizona, which includes Lakes Mead and Mohave, supports 50% of all Arizona boating days. Clark County, Nevada, includes Lakes Mead and Mohave, and accounts for approximately 60% of the boats registered in Nevada. From 1937 to 1996 there were 564 fatalities in Lake Mead National Recreation Area. Half of the fatalities occurred in the first 40 years, and the other half occurred in the last 19 years. Of these, 214 were boating accidents and 64% were local residents. Drowning was the cause of death in 89% of the fatalities. Overall, the water-related fatality rate peaked between 1971 and 1975, but has been in decline since then. In 1999, personal watercraft accounted for approximately 35% of the boating fleet and were involved in 33% of the boating accidents. With the visitation at 9.4 million visitors per year, the fatality rate is 1.3 deaths per million visitors.

LAKE OPERATING LEVELS

This plan addresses park management at normal operating conditions of the lakes (water elevations 1,180 and 1,210 feet above mean sea level).

On Lake Mead, the average daily elevation for the last 10 years (1991 through 2002) was 1,193.9 feet above mean sea level. The elevation of 1,221.4 feet above mean sea level represents the elevation at the top of the spillway gates. On July 12, 1983, a maximum water surface elevation of 1,225.85 feet above mean sea level was reached on Lake Mead. The theoretical minimum elevation required to generate power is 1,083 feet above mean sea level, and the minimum elevation required for the operation of the Southern Nevada Water Authority's original intake facility is 1,050 feet above mean sea level.

Between 1992 and 2002, Lake Mead has operated between water surface elevations of 1,154 and 1,215 feet above mean sea level. Lake Mead may increase or decrease its operating levels due to the adoption of Colorado River Interim Surplus Criteria by the Bureau of Reclamation and the above or below normal snowpack conditions. The Surplus Criteria will determine the surplus water conditions in the lower Colorado River Basin for the time period 2002

through 2016. The impacts on recreational resources from this action have been addressed in the *Colorado River Interim Surplus Criteria Final Environmental Impact Statement*, December 2000 that was prepared by the Bureau of Reclamation (BOR 2000). A summary of the impacts as they relate to the park operation of Lake Mead National Recreation Area is found in appendix C.

SOCIOECONOMIC RESOURCES

Lake Mead National Recreation Area is located in Clark County, Nevada, and Mohave County, Arizona. Communities adjacent to the recreation area include the greater Las Vegas area, which comprises the cities of Las Vegas, North Las Vegas, Henderson, and Boulder City. South of the recreation area are the cities of Laughlin, Nevada, and Bullhead City, Arizona. There is also a substantial portion of the land in Clark County that is managed by the county and is referred to as Unincorporated Clark County.

According to the U.S. Census Bureau (2000), the population of the greater Las Vegas area was estimated at just over 1.4 million, with an average growth of nearly 7,000 new residents per year. This high growth rate makes Clark County one of the fastest growing regions in the nation. In 1999 the average per capita income in the metropolitan area of Las Vegas was \$29,000. The largest employment sector in Clark County in 1992 was the service industry, followed by administrative support and retail/sales. The population of Mohave County in 1999 was just over 134,000 residents, with a median income of \$20,000 (U.S. Census Bureau 2000). The largest employment sector in Mohave County in 1992 was retail, followed by service and manufacturing.

ECONOMIC EFFECTS OF THE PARK

Tourism is an important component of the region surrounding Lake Mead National Recreation Area,

and much of the tourism revolves around the gaming industry. The recreation area provides a valuable resource to the area, contributing to the local economy through the sale and rental of boats and other water-related equipment, camping equipment, and other recreational equipment, as well as services and maintenance, hotels, restaurants, and travel-related services. According to a report by a local personal watercraft rental business, income from renting a fleet of 30 personal watercraft over one summer can generate a gross income of nearly \$350,000. With approximately 100 personal watercraft rentals available in the Las Vegas and Henderson area, the income from these rentals amounts to over \$1 million.

While it is difficult to accurately isolate and quantify the impacts of Lake Mead National Recreation Area on the economy, it is estimated that the total annual impact of the recreation area on the gateway communities and region is in the millions of dollars.

The in-park concession operations at Lake Mead National Recreation Area collectively gross \$45 million. The *Commercial Services Plan* (appendix A) outlines the types of sales and services available in the recreation area, including marina operations, boat repair, canoe/raft deliveries, fishing guides, motorized vehicle tours, SCUBA instruction and charters, and waterski instruction.

Environmental Consequences

INTRODUCTION

The purpose of this *Lake Management Plan* is to guide the management of Lake Mead National Recreation Area for the foreseeable future. Impacts of the alternatives are evaluated, with [consideration](#) given to the impacts of personal watercraft use within the recreation area, as directed by the [terms](#) of the [December 2000](#) settlement agreement with Bluewater Network (*Bluewater Network v. Robert Stanton*, No. CV02093). Table 42 provides a summary of the impacts for each topic evaluated under the four alternatives.

Since the plan does not provide detailed site designs for any proposed development area, but proposes a general direction for visitor use and resource protection throughout the area, a general analysis of environmental impacts is provided. If proposed actions are approved, an additional environmental analysis would be completed, and specific impacts would be evaluated from alternative site designs and construction options prior to initiating any construction or development activity. As site plans are developed for specific locations and proposed projects are scheduled for implementation, detailed environmental analysis and documentation would be provided, as needed. This would include obtaining all necessary permits and approvals from state and federal regulatory agencies.

SUMMARY OF LAWS AND POLICIES

Three overarching environmental protection laws and policies guide the National Park Service (NPS): the *National Environmental Policy Act (NEPA) of 1969* and its implementing regulations, the *National Parks Omnibus Management Act of 1998*, and the *National Park Service Organic Act of 1916*.

The *National Environmental Policy Act* is implemented through regulations of the Council on Environmental Quality (CEQ) (40 CFR 1500–8). The National Park Service has in turn adopted procedures to comply with NEPA and the CEQ regulations, as found in *Director's Order 12: Conservation Planning, Environmental Impact Analysis, and Decision Making* (NPS 2000a) and its accompanying handbook.

The *National Parks Omnibus Management Act* underscores the *National Environmental Policy Act*, and both acts are fundamental to NPS park management decisions. Both acts provide direction for articulating and connecting the ultimate resource management decision to the analysis of impacts, using appropriate technical and scientific information. Both also recognize that such data may not be readily available, and they provide options for resource impact analysis should this be the case.

The *Omnibus Act* directs the National Park Service to obtain scientific and technical information for analysis. The NPS handbook for *Director's Order 12* states that if “such information cannot be obtained due to excessive cost or technical impossibility, the proposed alternative for decision will be modified to eliminate the action causing the unknown or uncertain impact or other alternatives will be selected” (Section 4.4).

Section 4.5 of *Director's Order 12* adds to this guidance by stating “when it is not possible to modify alternatives to eliminate an activity with unknown or uncertain potential impacts, and such information is essential to making a well-reasoned decision, the National Park Service will follow the provisions of the regulations of the Council on Environmental Quality (40 CFR 1502.22).” In summary, the National Park Service must state in an environmental assessment or impact statement whether such information is incomplete or unavailable, the relevance of the incomplete or unavailable information to evaluating reasonably foreseeable significant adverse impacts on the human environment, a summary of existing credible scientific studies showing adverse impacts that are relevant to evaluating the reasonably foreseeable significant adverse impacts, and an evaluation of such impacts based upon theoretical approaches or research methods generally accepted in the scientific community.

The NPS *Organic Act* commits the National Park Service to making informed decisions that perpetuate the conservation and protection of park resources unimpaired for the benefit and enjoyment of future generations.

TABLE 42: SUMMARY COMPARISON OF THE IMPACTS OF THE ALTERNATIVES

Impact Topic	Alternative A (No Action)	Alternative B	Alternative C ¹ (Modified Preferred Alternative)	Alternative D (Baseline)
Air Quality	Under alternative A, hydrocarbon (HC) emissions would be 369 tons in 2004 and 320 tons in 2012, compared with alternative D (918 in 2004 and 659 tons in 2012). Under alternative A, elimination of personal watercraft along with replacement of other marine engines would result in HC emission reductions of 549 tons per year in 2004 and 339 tons per year in 2012 compared with alternative D (baseline).	Under alternative B, hydrocarbon (HC) emissions would be 346 tons in 2004 and 2012, compared with alternative D (918 and 659 tons). The reductions under alternative B would occur because all carbureted two-stroke engines would be eliminated after 2004. Under alternative B, elimination of these engines would result in HC emission reductions of 572 tons per year in 2004 and 313 tons per year in 2012 compared with alternative D (baseline).	Under alternative C, hydrocarbon emissions would be 904 tons in 2004 and 360 tons in 2012, compared with alternative D (918 and 659 tons). The reductions under alternative C would occur because carbureted two-stroke engines would be replaced with cleaner engines after 2012. Under alternative C, the conversion to cleaner engines would result in HC emission reductions of 299 tons per year in 2012 compared with alternative D (baseline).	Under alternative D, hydrocarbon (HC) emissions would be 659 tons in 2012. In the 2004 to 2012 period, the conversion to cleaner engines would result in HC emission reductions of approximately 259 tons per year. This reduction would continue in the years after 2012.
	Under alternative A, there would be a net reduction in HC+NO _x emissions of 480 tons per year in 2004 and 279 tons per year in 2012 when compared to alternative D (baseline) and a potential beneficial effect on regional ozone levels. The impact on human health from HC and NO _x would be minor in the long-term.	Under alternative B, there would be a net reduction in HC+NO _x emissions of 552 tons per year in 2004 and 306 tons per year in 2012 when compared to alternative D and a potential beneficial effect on regional ozone levels. The impact on human health from HC and NO _x would be minor in the long-term.	Under alternative C, there would be a net reduction in HC+NO _x emissions of 287 tons per year in 2012 when compared to alternative D and a potential beneficial effect on regional ozone levels. The impact on human health from HC and NO _x would be minor in the long-term.	Under alternative D, there would be a net reduction in HC and NO _x emissions of approximately 246 tons per year in 2012, compared to the emissions in 2004, and a potential beneficial effect on regional ozone levels. The impact on human health from HC and NO _x would be minor in the long-term.
	Under alternative A, by the year 2012, the ban would eliminate personal watercraft emissions of over 1,947 tons of carbon monoxide and 467 tons of hydrocarbons. Other pollutants would be eliminated as well. The impacts on human health vary depending upon the pollutant. Impacts from HC and NO _x would be minor, CO would be moderate,	Under alternative B, elimination of carbureted two-stroke engines would result in CO emission reductions of 166 tons per year in 2004 and 215 tons per year in 2012 compared with alternative D. The impact to human health from CO emissions would be minor.	Under alternative C, conversion of carbureted two-stroke engines would result in CO emission reductions of 83 tons per year in 2004 and 30 tons per year in 2012 compared with alternative D. The impact to human health from CO emissions would be minor.	Long-term emissions of HC, PM ₁₀ , and PM _{2.5} would decrease, while emissions of NO _x and CO would increase under alternative D. Impacts to human health would be negligible for particulates and moderate for HC, NO _x , and CO. Alternative D would result in a potential reduction of regional ozone formation. This would lead to a potential reduction in the SUM06 index.

Impact Topic	Alternative A (No Action)	Alternative B	Alternative C ¹ (Modified Preferred Alternative)	Alternative D (Baseline)
Air Quality (continued)	Impacts to air quality-related values would be moderate. PM _{2.5} reductions would contribute to an improvement in visibility, and the reduced ozone production would contribute to a reduced potential for plant damage. The impact is classified as moderate because of the existing SUM06 ozone index.	Impacts to air quality-related values would be moderate. PM _{2.5} reductions would contribute to an improvement in visibility, and the reduced ozone production would contribute to a reduced potential for plant damage. The impact is classified as moderate because of the existing SUM06 ozone index.	Impacts to air quality-related values would be moderate. PM _{2.5} reductions would contribute to an improvement in visibility, and the reduced ozone production would contribute to a reduced potential for plant damage. The impact is classified as moderate because of the existing SUM06 ozone index.	Based on the lack of evidence of ozone injury to plants and the anticipated reductions in ozone formation, but recognizing the existing SUM06 index, the estimated level of long-term adverse impact on air quality-related values from alternative D would be moderate.
	The pollutant concentrations in the Lake Mead National Recreation Area would continue to be within national ambient air quality standards. No changes are expected in the class II airshed status, because motorized boating activity will not result in a violation of any national air quality standard.	The pollutant concentrations in the Lake Mead National Recreation Area would continue to be within national ambient air quality standards. No changes are expected in the class II airshed status, because motorized boating activity will not result in a violation of any national air quality standard.	The pollutant concentrations in the Lake Mead National Recreation Area would continue to be within national ambient air quality standards. No changes are expected in the class II airshed status, because motorized boating activity will not result in a violation of any national air quality standard.	The pollutant concentrations in the Lake Mead National Recreation Area would continue to be within national ambient air quality standards. No changes are expected in the class II airshed status, because motorized boating activity will not result in a violation of any national air quality standard.
	Construction impacts from fugitive dust would be short-term and minor, as particulate emission impacts would be minimized by the use of dust-control measures.	There are no construction impacts since this alternative does not allow for expansion.	Construction impacts from fugitive dust would be short-term and minor, as particulate emission impacts would be minimized by the use of dust-control measures. Potential lead or asbestos hazards from facility renovation would be avoided by the use of licensed contractors for testing and removal of materials, if necessary, in accordance with federal and state regulations.	Construction impacts from fugitive dust would be short-term and minor, as particulate emission impacts would be minimized by the use of dust-control measures. Potential lead or asbestos hazards from facility renovation would be avoided by the use of licensed contractors for testing and removal of materials, if necessary, in accordance with federal and state regulations.
	Implementation of this alternative would not result in an impairment of the air quality resource..	Implementation of this alternative would not result in an impairment of the air quality resource.	Implementation of this alternative would not result in an impairment of the air quality resource.	Implementation of this alternative would not result in an impairment of the air quality resource.
Geologic Resources and Soils	The expansion of developed areas could occur in previously undisturbed areas and could damage soils by compaction, leading to increased erosion and runoff.	No disturbance to geologic resources and soils would occur under this alternative.	The expansion and development of new facilities and the construction of a beach access road (Northshore Loop Road) could impact previously undisturbed soil resources by soil removal, compaction, and erosion.	Same as under alternative C, without the impacts from the Northshore Loop Road construction.

Impact Topic	Alternative A (No Action)	Alternative B	Alternative C ¹ (Modified Preferred Alternative)	Alternative D (Baseline)
Geologic Resources and Soils (continued)	In the long-term, this alternative would have potentially minor to moderate adverse impacts.	In the long-term, there would be no effect from this alternative.	In the long-term, there could potentially be negligible adverse impacts.	In the long-term, there could be potentially minor adverse impacts.
Water Resources	Even with the elimination of personal watercraft, moderate impacts on water quality could occur during the summer in high-use areas or in coves where water flow is limited and where there is a lack of sanitation requirements. Antidegradation requirements could be surpassed during high-use periods, and certain areas could be temporarily or permanently closed to recreational use. Reduced water quality could harm aquatic organisms through algae blooms, suspended solids and turbidity, and oxygen depletion. However, the lakes hold an immense amount of water, with a large volume of water flowing through the system.	With the implementation of zoning, sanitation regulations, and the immediate conversion to efficient engines, the water quality of Lakes Mead and Mohave would improve, especially in high-use areas and inflow areas. The beneficial effects on water quality under this alternative could result in detectable improvements to the water quality in high-use coves during busy periods in the summer.	Some minor, temporary, localized impacts on water quality could occur around construction sites. Under this alternative, water quality in high-use areas should improve in the long-term as portable toilet requirements are implemented, sanitation is improved, and carbureted two-stroke engine use is eliminated after 2012. Areas would continue to be monitored to ensure recreational standards for water quality are met.	Under alternative D, water quality would likely improve in camping and high-use areas from the portable toilet requirements and the placement of additional restroom facilities. In the long-term, over the next 20 years, as carbureted two-stroke engines are replaced by direct-injection two-stroke and four-stroke engines, water quality in high-use areas should improve. However, until then, water quality in high-use coves during peak periods of use could experience minor to moderate impacts. There is the potential that activities related to sanitation and refueling could continue to create moderate to major impacts on water quality in high-use areas. Antidegradation standards could be surpassed during high-use periods, and certain areas could be temporarily or permanently closed to recreational use.

Impact Topic	Alternative A (No Action)	Alternative B	Alternative C ¹ (Modified Preferred Alternative)	Alternative D (Baseline)
Water Resources (continued)	<p>The threshold requirements to meet standards for alternative A are less than those required under baseline (alternative D) conditions for all compounds evaluated because under alternative A no personal watercraft are allowed.</p> <p>The threshold volumes at Lake Mead required to meet water quality standards in alternative A are 29% less than threshold volumes required for alternative D in the year 2004, and 19% less than alternative D in the year 2012.</p>	<p>Alternative B establishes the lowest boating capacity of all the alternatives, and would eliminate all carbureted two-stroke engines from the park by 2004. Although other engine types would replace the carbureted two-stroke engines, the replacement engines would be cleaner resulting in less pollutant load to the lakes. Adverse impacts from personal watercraft under alternative B would be negligible to minor because only personal watercraft using clean technology direct-injection four-stroke engines would be allowed on Lakes Mead and Mohave.</p> <p>Under alternative B the threshold volume of water required to meet water quality standards in both years (2004 and 2012) would be approximately 78,000 acre-feet, or less than 4% of the available mixing volume at Lake Mead; and approximately 40,000 acre-feet, or less than 6% at Lake Mohave. This would result in negligible to minor adverse effects on the water quality of Lakes Mead and Mohave. The threshold volumes required to meet water quality standards in alternative B are 65% less than threshold volumes required for alternative D at Lake Mead and 79% less than alternative D at Lake Mohave in 2004.</p>	<p>The total boating capacity for both lakes under alternative C is 5,055 boats at any one time, compared to 5,800 boats at any one time under alternative D in 2004.</p> <p>In 2004 at Lake Mead, a maximum threshold volume for all engine types would be approximately 199,000 acre-feet or 10% of the available mixing volume would be required to meet water quality standards. This would be considered a negligible to minor adverse impact. The threshold volumes required to comply with water quality standards at Lake Mead under alternative C are 12% less than threshold volumes required for alternative D in the year 2004.</p>	<p>The total boating capacity for both lakes under alternative D is 5,800 boats at any one time.</p> <p>In 2004 at Lake Mead, a maximum threshold volume of approximately 226,000 acre-feet or about 11% of the available mixing volume would be required to meet water quality standards. This would be considered a negligible to minor adverse impact.</p>

Impact Topic	Alternative A (No Action)	Alternative B	Alternative C ¹ (Modified Preferred Alternative)	Alternative D (Baseline)
Water Resources (continued)	<p>Threshold volumes at Lake Mohave required to meet water quality standards are 47% less than alternative D in 2004 and 43% less than alternative D in 2012.</p>		<p>In 2012 at Lake Mead, when carbureted two-stroke engines would be eliminated, a maximum threshold volume of 86,000 acre-feet or approximately 4% of the available mixing volume would be required to meet the water quality standards. This would be considered a negligible to minor adverse impact. The threshold volumes required to meet water quality standards at Lake Mead under alternative C are 48% less than alternative D in 2012.</p> <p>The maximum threshold volume of water required to meet water quality standards at Lake Mohave in 2004 for all engine types would be 165,000 acre-feet or approximately 24% of the available mixing volume. This would be considered a negligible to minor adverse impact. The threshold volumes required to meet water quality standards at Lake Mohave in 2004 under alternative C are 15% less than threshold volumes required for alternative D.</p>	<p>With further reduction in emissions in the year 2012 at Lake Mead, maximum threshold volume would decrease to approximately 166,000 acre-feet or about 8% of the available mixing volume.</p> <p>The maximum threshold volume of water required to meet water quality standards at Lake Mohave in 2004 would be 193,000 or about 28% of the available mixing volume. This would also be considered a negligible to minor adverse impact.</p>

Impact Topic	Alternative A (No Action)	Alternative B	Alternative C ¹ (Modified Preferred Alternative)	Alternative D (Baseline)
Water Resources (continued)	Based on the impact threshold definitions, the effect from the use of all watercraft allowed under alternative A would cause negligible to minor adverse effects on the water quality of Lakes Mead and Mohave.	Under alternative B threshold volumes required to meet water quality standards are 53% less than alternative D at Lake Mead and 69% less than alternative D at Lake Mohave in the year 2012. There would be short- and long-term benefits from implementing alternative B.	In 2012 at Lake Mohave, a maximum threshold volume of 51,000 acre-feet or approximately 7% of the available mixing volume would be required to meet the water quality standards. This would be considered a negligible to minor adverse impact. The threshold volumes required to meet water quality standards at Lake Mohave under alternative C are 61% less than alternative D in 2012. Effects would be long-term because they would recur annually during the summer heavy-use season.	The reduction in emissions at Lake Mohave in 2012 would require a maximum threshold volume of 130,000 acre-feet or about 19% of the available mixing volume. The impact to water quality would be negligible to minor, however, in confined areas such as coves with high watercraft use impacts could be detectable but would still be within water quality standards or criteria. Effects would be long-term because they would recur annually during the summer heavy-use season; however, water quality would remain within historical or desired water quality conditions.
	Implementation of this alternative would not result in an impairment of the water quality resource.	Implementation of this alternative would not result in an impairment of the water quality resource.	Implementation of this alternative would not result in an impairment of the water quality resource.	Implementation of this alternative would not result in an impairment of the water quality resource.
Vegetation	Individual plants from the creosote-bursage community could be removed or destroyed during the expansion projects. Revegetation efforts could replace some native vegetation lost due to construction activities. Rare plants and their habitat could be damaged by continued and increasing visitor use in shoreline areas where these species are present. Nonnative salt cedar would be removed from some locations. Some native riparian vegetation would be restored in selected shoreline areas. In the long-term, there would be minor adverse impacts on vegetation under this alternative, primarily from the loss of habitat from increasing visitor use.	No disturbance would occur to vegetation from development activities. Shoreline areas that support rare plant species would be monitored and closures implemented to protect these resources. Nonnative salt cedar would be removed from some locations. In the long-term, there could be negligible to minor adverse impacts on vegetation under this alternative, primarily from the lack of a riparian restoration program.	Individual plants from the creosote-bursage community could be removed or destroyed by construction activities. Revegetation efforts could replace some native vegetation lost due to construction activities. Rare plants and their habitat would be monitored and additional protective measures would be established if necessary. Riparian habitat could be restored in selected areas by removing nonnative salt cedar and replanting native vegetation. In the long-term, there could potentially be some beneficial effects to vegetation under this alternative due to the riparian restoration program and the rare-plant monitoring program.	Impacts on vegetation from the construction and expansion of facilities would be the same as under alternative C. Rare plants and their habitat would be monitored and additional protective measures would be established if necessary. Riparian areas would not be restored as no shoreline enhancement would occur. In the long-term, there could be some minor adverse impacts on vegetation under this alternative from increasing recreational use and no riparian restoration program in shoreline areas.

Impact Topic	Alternative A (No Action)	Alternative B	Alternative C ¹ (Modified Preferred Alternative)	Alternative D (Baseline)
Wildlife	<p>Wildlife could be displaced from their habitat and temporarily disturbed as a result of construction activities.</p> <p>Noise from motorized vessels could disturb wildlife species that occupy the shoreline and inflow areas.</p> <p>Operation of personal watercraft in wildlife habitat would be eliminated.</p> <p>In the long-term, with increasing use in all areas of the lake by motorized vessels, including the inflow and shoreline areas, there could be minor to potentially major adverse impacts on wildlife and wildlife habitat.</p>	<p>No adverse impacts on wildlife would occur under this alternative.</p> <p>Wildlife that occupies or utilizes the shoreline areas could be temporarily disturbed by the continued use of motorized vessels.</p> <p>Wildlife habitat could be further protected from noise and disturbance from motorized vessels in areas zoned for primitive and semiprimitive use.</p> <p>Shoreline fishing enhancement facilities might improve fish habitat.</p>	<p>Wildlife would be disturbed and marginal habitat would be removed as a result of construction activities. Impacts would be minor, short-term, and localized during construction.</p> <p>Wildlife that occupies or utilizes the shoreline areas could be temporarily disturbed by the continued use of motorized vessels.</p> <p>Wildlife and aquatic habitat could be further protected from noise and disturbance from motorized vessels in areas zoned for primitive and semiprimitive use.</p> <p>Shoreline fishing enhancement facilities might improve fish habitat.</p> <p>In the long-term, there could be some beneficial effects on wildlife and wildlife habitat due to the restrictions on motorized use in sensitive habitat.</p>	<p>Impacts on wildlife would be the same as under alternative C except no impacts would occur from road construction activities.</p> <p>No additional protection through zoning would occur at the inflow areas; thus disturbance to wildlife from motorized vessels could continue.</p> <p>Shoreline fishing enhancement facilities might improve fish habitat.</p> <p>In the long-term, there could be minor to potentially major adverse impacts on wildlife and wildlife habitat, primarily in the sensitive inflow areas, where there would be no restrictions on motorized use.</p>
Threatened and Endangered Species	<p>The expansion of existing facilities could alter potential desert tortoise habitat.</p> <p>Noise and wake from motorized vessels could disturb willow flycatchers during nesting periods.</p> <p>Operation of personal watercraft would be eliminated in threatened and endangered species habitat and potential habitat.</p>	<p>No adverse impacts on threatened and endangered species would occur under this alternative.</p> <p>Willow flycatchers might benefit from the establishment of primitive zones around inflow areas.</p>	<p>The expansion of existing facilities and the development of new facilities could potentially damage low-quality desert tortoise habitat, but designated critical habitat would not be adversely modified.</p> <p>Southwestern willow flycatcher habitat in the sensitive inflow areas would be further protected by semiprimitive and primitive zoning and temporal closures.</p> <p>Temporal zoning could be established in known habitat to protect fish species. This could protect native fish species from the impacts associated with motorized use.</p>	<p>Facility development and expansion could have the same potential impacts as under alternative C.</p> <p>No further protective zoning would be established around willow flycatcher habitat, and this could result in motorized vessels disturbing nesting sites.</p>

Impact Topic	Alternative A (No Action)	Alternative B	Alternative C ¹ (Modified Preferred Alternative)	Alternative D (Baseline)
Threatened and Endangered Species (continued)	<p>In the long-term, there could be minor to moderate adverse impacts from allowing continued motorized use in the sensitive inflow areas, and beneficial effects to sensitive habitat from the elimination of personal watercraft use in these areas.</p> <p>Under the evaluation of section 7 of the Endangered Species Act, the determination has been reached that this alternative would have no effect on the California brown pelican; would not likely adversely affect the bald eagle, peregrine falcon, Yuma clapper rail, and Western snowy plover; and would likely adversely affect desert tortoise, willow flycatcher, razorback sucker, and bonytail chub.</p>	<p>In the long-term, there would be some beneficial effects from the restriction of motorized use in sensitive inflow areas, and there could be beneficial effects from the 100-foot shoreline flat-wake zone.</p> <p>Under the evaluation of section 7 of the Endangered Species Act, the determination has been reached that this alternative would have no effect on the California brown pelican; would not likely adversely affect the bald eagle, peregrine falcon, Yuma clapper rail, Western snowy plover and willow flycatcher.</p> <p>Since the overall effect of this alternative would be beneficial by improving aquatic habitat, but would also cause some adverse effects from continued recreational activities creating temporary disturbances during spawning activities, it has been determined that this alternative would likely adversely affect razorback sucker, and bonytail chub.</p>	<p>In the long-term, there would be some beneficial effects from the restriction of motorized use in sensitive inflow areas, and there could be beneficial effects from the temporal zoning designations.</p> <p>Under the evaluation of section 7 of the Endangered Species Act, the determination has been reached that this alternative would have no effect on the California brown pelican; would not likely adversely affect the bald eagle, peregrine falcon, Yuma clapper rail, Western snowy plover and willow flycatcher since the overall effect of this alternative would be beneficial by improving aquatic habitat.</p> <p>Implementing this alternative would likely cause some adverse effects from continued recreational activities creating temporary disturbances during spawning activities, therefore, it has been determined that this alternative would likely adversely affect razorback sucker and bony tail chub.</p> <p>Due to the nature of proposed construction activities within desert tortoise habitat, there is the potential to adversely effect the desert tortoise from direct take or loss of habitat. Mitigation measures would be in place prior to any construction activities.</p>	<p>In the long-term, there could be minor to moderate adverse impacts from the continued use of motorized vessels in all portions of the lakes. However, the 300-foot shoreline flat-wake zone could limit this impact to minor.</p> <p>Under the evaluation of section 7 of the Endangered Species Act, the determination has been reached that this alternative would have no effect on the California brown pelican; would not likely adversely affect the bald eagle, peregrine falcon, Yuma clapper rail, Western snowy plover and willow flycatcher since the overall effect of this alternative would be beneficial by improving aquatic habitat.</p> <p>Implementing this alternative would likely cause some adverse effects from continued recreational activities creating temporary disturbances during spawning activities, therefore, it has been determined that this alternative would likely adversely affect razorback sucker and bony tail chub. Additional protection might be provided through the implementation of the 300-foot shoreline flat-wake zone.</p> <p>Due to the nature of proposed construction activities within desert tortoise habitat, there is the potential to adversely effect the desert tortoise from direct take or loss of habitat. Mitigation measures would be in place prior to any construction activities.</p>

Impact Topic	Alternative A (No Action)	Alternative B	Alternative C ¹ (Modified Preferred Alternative)	Alternative D (Baseline)
Cultural Resources	No impacts would occur on cultural resources.	Same as under alternative A.	Same as under alternative A.	Same as under alternative A.
Visitor Use, Experience, and Safety	<p>A narrower range of recreational opportunities would be available as zoning would be limited to rural natural, urban natural, and urban park settings.</p> <p>High-use areas would continue to be crowded during summer areas.</p> <p>Shoreline camping areas and beaches would continue to exceed standards for litter and sanitation.</p> <p>Only state-imposed educational requirements would be implemented</p> <p>Potential conflicts from personal watercraft would be eliminated.</p> <p>Personal watercraft use and associated conflicts would be eliminated.</p> <p>Nonmotorized users might be disappointed because there would be no areas zoned specifically for their use.</p> <p>In the short-term, the visitor experience for boaters other than personal watercraft users would improve. However, over time, as boating densities exceed current use levels, the experience could deteriorate.</p>	<p>A wide range of recreational opportunities would be available across all settings. There would be less lake available to motorized users. Nonmotorized users would benefit from the zoning of primitive and semi-primitive areas.</p> <p>There would be more opportunities for nonmotorized use in the Black Canyon.</p> <p>Motorized users might be disappointed that portions of the lake are restricted and nonmotorized users might be disappointed that more of the lake is not restricted.</p> <p>Visitor safety might improve due to imposing the flat-wake zone.</p> <p>Boating safety should improve with the implementation of educational requirements and the continuation of regulations regarding alcohol use.</p>	<p>A wide range of recreational opportunities would be available across all settings. There would be less lake available to motorized users, but more than under alternative B. Nonmotorized users would benefit from the primitive and semi-primitive zoning from decreased noise and wakes from motorized vessels.</p> <p>Opportunities for nonmotorized use in the Black Canyon would increase.</p> <p>Motorized users might be disappointed that portions of the lake are restricted, and nonmotorized users might be disappointed that more of the lake was not restricted.</p> <p>Visitor safety might improve due to imposing the 200-foot flat-wake zone proposed around beaches frequented by bathers, boats at the shoreline, and near people in the water and at the water's edge.</p>	<p>A narrower range of recreational opportunities would be available as zoning would be limited to rural natural, urban natural, and urban park settings.</p> <p>Visitor satisfaction might be impacted by the restricted uses imposed by mandatory zoning around the lakes. Nonmotorized users might be disappointed because there would be no areas zoned specifically for their use.</p> <p>Visitor safety might improve due to imposing the 300-foot flat-wake zone, restricting alcohol use throughout the park, and implementing the boating education requirements. Safety might be detrimentally impacted by too many visitors in high-use areas..</p>

Impact Topic	Alternative A (No Action)	Alternative B	Alternative C ¹ (Modified Preferred Alternative)	Alternative D (Baseline)
Visitor Use, Experience, and Safety (continued)		The recreational setting of the lakes would improve with the sanitation requirements.	<p>Visitor conflicts might decrease and visitor satisfaction might increase due to zoning and establishing a variety of recreational settings.</p> <p>Visitor safety might improve due to instituting the education requirement for boat operators and implementing uniform boating laws.</p> <p>The recreational setting of the lakes would improve with the implementation of the proposed sanitation requirements and litter removal goals.</p>	<p>Visitor satisfaction might decrease as use levels were increased beyond the park carrying capacity, which would cause overcrowding throughout the lakes.</p> <p>Shoreline sanitation and litter removal requirements would help improve the quality of the recreational setting.</p>
	In the long-term, there could be moderate to major adverse impacts on the visitor experience and safety due to increased boating densities, shoreline crowding, and sanitation and litter issues.	In the long-term, there could be some beneficial effects on some visitors and some moderate adverse impacts on other visitors, depending on their expectations.	In the long-term, there could be some beneficial effects on some visitors and some moderate adverse impacts on other visitors, depending on their expectations.	In the long-term, there could be moderate to major adverse impacts from increased use levels, overcrowding, and restrictions placed on visitor use.
Soundscapes	Under this alternative, there would be no areas set aside to preserve the natural quiet on Lakes Mead or Mohave. As new regulations are imposed and carbureted two-stroke engines are replaced by newer, quieter models, noise levels would be reduced on the lakes. Noise from personal watercraft would be eliminated from the lakes, but would be expected to be gradually replaced by additional boats.	Under this alternative, the inflow areas of the Virgin and Muddy Rivers, Pearce Ferry, and the Gypsum Bed areas would be designated for nonmotorized use only. This would serve to protect the soundscape and the natural quiet in these areas, which would be a beneficial impact on nonmotorized recreationists and the natural resources in those areas including wildlife. The northern portion of Black Canyon above Willow Beach would be zoned primitive year-round to prohibit motorized uses. This would allow for the natural sounds to be the primary sounds during those periods, benefiting wildlife and visitors.	This alternative would provide a higher level of protection to the soundscape in the sensitive inflow area than under alternatives A and D, but would not protect as large of an area as under alternative B. On Lake Mead, the inflow area of the Virgin River and the Gypsum Bed areas would be designated as a primitive area, with nonmotorized uses and electric trolling motors only under this alternative. This would serve to protect the soundscape and natural quiet in those areas, which would be a beneficial impact on nonmotorized recreationists, and the natural resources in those areas including wildlife. The semiprimitive areas would be located at the Muddy River inflow area (Overton Wildlife Management Area), in Bonelli Bay, and Grand Wash Bay of Lake Mead.	<p>Noise from motorized vessels would continue to impact recreationists in all areas of Lakes Mead and Mohave. There would be no areas zoned to limit motorized vessels.</p> <p>Construction activities would temporarily impact localized areas creating minor impacts from noise.</p> <p>Considering the enabling legislation, the history of motorized vessel use at Lake Mead National Recreation Area, and the park's goals and objectives to protect park resources and values, some noise from this source of recreational use is appropriate. Noise from motors would continue to have a moderate impact on the soundscape in all areas of Lakes Mead and Mohave.</p>

Impact Topic	Alternative A (No Action)	Alternative B	Alternative C ¹ (Modified Preferred Alternative)	Alternative D (Baseline)
Soundscapes (continued)	<p>Overall noise from motorized vessels would be considered a minor to moderate impact in the less developed areas, and a moderate to major impact in the more developed areas.</p> <p>Construction activities would temporarily impact localized areas creating minor impacts from noise.</p> <p>Considering the enabling legislation, the history of motorized vessel use at the recreation area, and the park's goals and objectives to protect park resources and values, some noise from this source of recreational use is appropriate.</p> <p>In the long-term, the adverse impacts to the soundscape under this alternative would be minor to moderate.</p>	<p>There would be no impact for construction activities under this alternative.</p> <p>Considering the enabling legislation, the history of motorized vessel use at the recreation area, and the park's goals and objectives to protect park resources and values, some noise from this source of recreational use is appropriate.</p> <p>The 100-foot flat-wake zone could also reduce the impacts of noise on people and wildlife on the shoreline.</p> <p>Overall, this alternative would better protect the natural soundscape in remote, isolated and designated primitive areas of the recreation area.</p>	<p>On Lake Mohave, the northern portion of Black Canyon above Willow Beach would have temporal zoning that would prohibit motorized use two days per week year-round. This would allow for the natural sounds to be the primary sounds during those periods, and would serve to benefit nonmotorized recreationists, as well as wildlife species in the canyon.</p> <p>Construction activities would temporarily impact localized areas creating minor impacts from noise.</p> <p>Considering the enabling legislation, the history of motorized vessel use at Lake Mead National Recreation Area, and the park's goals and objectives to protect park resources and values, some noise from this source of recreational use is appropriate. The continued use of motors would continue to have a moderate impact on the soundscape. Stricter regulations that would be easier to enforce and the elimination of carbureted two-stroke engines would reduce noise. Impacts under the modified alternative C would not result in impairment to the park's soundscape.</p>	<p>Stricter regulations and the enforcement of the boating noise standards would reduce the noise from vessels operating over 75 decibels. The 300-foot flat-wake zone could reduce noise from motorized vessels at the shoreline.</p> <p>There could be moderate to major impacts in the sensitive inflow areas from the noise associated with existing and increasing use by motorized vessels. The impact would negatively affect the wildlife located there and visitors with the expectation of natural quiet.</p>

Impact Topic	Alternative A (No Action)	Alternative B	Alternative C ¹ (Modified Preferred Alternative)	Alternative D (Baseline)
Soundscapes (continued)			<p>The continued use of motorized vessels, including personal watercraft, would continue to create minor to moderate impacts on the soundscape in the high-use and development zones of Lakes Mead and Mohave. There would be beneficial impacts from eliminating motorized use in the primitive zones, and restricting motorized use (except electric trolling motors) in the semiprimitive zones. However, it is likely that visitors to these areas could experience minor to moderate impacts as noise travels from adjacent zones.</p> <p>After 2012 there will be reduction in noise with the elimination of carbureted two-stroke engines. While this alternative would protect more area than under alternatives A and D, it would protect less area than under alternative B.</p> <p>Noise from personal watercraft would continue in those areas zoned for motorized use.</p>	
		In the long-term, there would be slight beneficial effects on the soundscape from the restrictions placed on motorized use in the sensitive inflow areas and in Black Canyon. Noise from personal watercraft would continue to create moderate adverse impacts to those visitors who are disturbed by the character of the noise.	In the long-term, there would be slight beneficial effects on the soundscape from the restrictions placed on motorized use in the sensitive inflow areas and in Black Canyon. Noise from personal watercraft would continue to create moderate adverse impacts on those visitors who are disturbed by the character of the noise.	In the long-term, there would be moderate adverse impacts on the soundscape as there would be no area set aside on the lakes to allow for visitors to enjoy the natural quiet. There would continue to be motorized vessels in the sensitive inflow areas, which could negatively impact wildlife in those areas.

Impact Topic	Alternative A (No Action)	Alternative B	Alternative C ¹ (Modified Preferred Alternative)	Alternative D (Baseline)
Socioeconomic Resources	Socioeconomic resources within and outside the recreation area would benefit from increased visitation and expanded facilities. However, this would be negated by the ban on personal watercraft, which could create a major negative impact on concession-operated facilities and businesses in the area that sell or rent personal watercraft.	<p>Under this alternative, all concession-operated facilities within the park, with the exception of Willow Beach, could benefit slightly from the predicted annual increase in visitation. However, no expansion would be allowed at any concession-operated facility, creating a negative impact on concessioners that had expectations of growth.</p> <p>Concession operations could be negatively impacted from the restrictions on glass, styrofoam, and by the ban on carbureted two-stroke engines, though these would be temporary impacts.</p> <p>With the immediate ban on two-stroke engines, 100% of the businesses related to the park that rent or sell carbureted two-stroke engines would be negatively impacted.</p> <p>Businesses that sell or rent direct-injection two-stroke, and four-stroke engines at the recreation area would benefit under this alternative.</p> <p>The overall effect of the immediate ban of carbureted two-stroke engines would result in a decrease of less than 0.1% of the total revenues of the regional economy, creating a less than negligible impact.</p>	<p>The expansion of selected facilities and concession services would benefit the concessioners.</p> <p>Except for prohibiting the sale of glass beverage containers and styrofoam within the recreation area, which could cause minor impacts from reduced income, until alternative containers are developed.</p> <p>Concessioners (except the Willow Beach operation) should benefit from this alternative due to increased park visitation and improved visitor facilities. Willow Beach could be negatively impacted by the temporal semiprimitive designation of Black Canyon and the reduction of motorized vessel use through the proposed restrictions. Concessioners located where expansion would be authorized would benefit from increased services and facilities. Adjacent communities could benefit from increased visitation to the recreation area.</p>	<p>The expansion of selected facilities and concession services would benefit the concessioners.</p> <p>The restricted sale of alcohol and glass and styrofoam containers would adversely impact concessioner revenue until alternative packaging is developed.</p> <p>Adjacent communities could benefit from increased visitation.</p>

Impact Topic	Alternative A (No Action)	Alternative B	Alternative C ¹ (Modified Preferred Alternative)	Alternative D (Baseline)
Socioeconomic Resources (continued)			<p>The economy of adjacent communities and the region could benefit from the expected growth in visitation to the recreation area. However, businesses that rent or sell older model carbureted two-stroke engines and personal watercraft could be burdened with stock they could not sell after 2012. However, this alternative would have less impact compared with alternative B because of the 10-year timeframe allowed for conversion to the cleaner engines. Businesses that sell or rent direct-injection two-stroke and four-stroke engines would benefit from the new requirements at the recreation area.</p>	
	In the long-term, there could be potentially major adverse impacts, primarily from the ban of personal watercraft from the recreation area.	In the long-term, there could be potentially moderate adverse impacts primarily from the ban on noncarbureted two-stroke engines.	In the long-term, there could be potentially moderate adverse impacts as carbureted two-stroke engines are restricted after 2012. There could be some slight beneficial effects on the local economy as the carbureted two-stroke engines are replaced.	Initially, there could be some slight beneficial effects from the probable increase in visitation. In the long-term, there could be potentially minor adverse impacts as visitor dissatisfaction could eventually lead visitors to look elsewhere for their recreational experience.
Park Operations	<p>Staffing requirements within the recreation area would not be achieved.</p> <p>In the long-term, there could be potentially moderate to major adverse impacts on park operations under this alternative due to the lack of staff to fulfill the park management goals.</p>	<p>Additional park staff would be required to implement this alternative.</p> <p>In the long-term, there could be potentially moderate adverse impacts under this alternative, but there would be a plan in place to justify more positions that could lead to an increase in staff to support park management goals.</p>	Same as under alternative B.	Same as under alternative B.

Impact Topic	Alternative A (No Action)	Alternative B	Alternative C ¹ (Modified Preferred Alternative)	Alternative D (Baseline)
Sustainability and Long-term Management	<p>Adverse impacts on soil and vegetative resources from new site development and expansion could not be avoided under this alternative and could cause some habitat loss and irretrievable commitment of these resources; however, the adoption of effective mitigation measures would reduce impacts.</p> <p>Continued use of carbureted two-stroke engines and sanitation problems along the lakeshore could adversely impact water quality, and recreational water quality standards could be exceeded during certain periods at high-use areas. Overall, irreversible or irretrievable commitment of resources is not expected because of the size of the lake; however, reduced water quality could force area closures and potentially harm aquatic organisms with algae blooms, suspended solids and turbidity, and oxygen depletion.</p>	<p>This alternative would not result in any loss of long-term productivity, irreversible or irretrievable commitments of resources, or any adverse impacts on park resources.</p>	<p>Adverse impacts on soil and vegetative resources from new site development and expansion could not be avoided under this alternative and could cause some habitat loss and irretrievable commitment of these resources; however, the adoption of effective mitigation measures would reduce impacts.</p> <p>Prohibiting the use of carbureted two-stroke engines in 2012 and implementing sanitation requirements could reduce water quality impacts.</p> <p>The original riverine environment has been altered by construction of the reservoirs and invasion of exotic species. Implementation of this alternative would not amplify these impacts on the existing overall quality and productivity of the Mojave Desert ecosystem within the recreation area.</p>	<p>The types of impacts would be similar to those in alternative C, but the level of impact could be higher due primarily to zoning differences. Allowing increased visitor use along the lakeshore in urban natural and urban park zones would focus visitation and impacts on these areas.</p> <p>Continued use of carbureted two-stroke engines until 2025 could adversely impact water quality, and recreational water quality standards could be exceeded during certain periods at high-use areas. It is uncertain if this would contribute to irreversible or irretrievable commitments of resources; however, reduced water quality could force area closures and potentially harm aquatic organisms with algae blooms, suspended solids and turbidity, and oxygen depletion.</p> <p>The overall productivity of the Mojave Desert ecosystem would not be impacted because increased visitor use would be concentrated along the shoreline.</p>
1. Alternative C is the environmentally preferred alternative.				

METHODOLOGY

This environmental consequences section analyzes both beneficial and adverse impacts that could result under the four alternatives. Impacts are evaluated based on context, duration, intensity, and whether they are direct, indirect, or cumulative impacts. In addition, impairment to park resources and values is considered. Impacts are evaluated based on the most current and comprehensive scientific and social data available.

All the information was not generated at Lake Mead National Recreation Area, but certain information from other areas was used to determine potential impacts within the recreation area.

PERSONAL WATERCRAFT USE

Considerable information was available on the effects of motorized vessels, including personal watercraft, on a variety of resources, including [soundscapes](#), [wildlife](#), [wildlife habitat](#), [shoreline vegetation](#), [water quality](#), [air quality](#), [visitor conflicts](#), and [visitor safety](#). Biologists and specialists within and outside the National Park Service, including specialists from the Bureau of Reclamation, [U.S. Fish and Wildlife Service](#), Nevada Division of Wildlife, Arizona Game and Fish Department, University of Nevada (Las Vegas), and University of Arizona were contacted to assist with interpreting the information and to provide additional information related to impacts of motorized uses on natural resources and the visitor experience. In addition, a NPS interdisciplinary planning team created a process for assessing the impacts of personal watercraft use based upon *Director's Order 12* (NPS 2000a, Section 4.5(g)).

Much has been observed and documented about the overall effects of personal watercraft on the environment, as well as public safety concerns. However, the site-specific impacts, or impacts on any particular resource, under all conditions and scenarios are more difficult to measure and affirm with absolute confidence. Even with monitoring and the data collected since personal watercraft were introduced in parks, it is difficult to define and quantitatively measure the effects of personal watercraft on park resources relative to other uses and influences.

The issues and concerns presented in the “Purpose of and Need for the Plan” chapter were further focused and defined to assess the various personal watercraft management alternatives given the context, duration, and intensity of the effects on park resources. Thresholds were established for each impact topic to help understand the magnitude and severity of changes (both adverse and beneficial) in resource conditions that could occur under the four management alternatives.

The impacts resulting under each alternative are compared with a baseline to determine the relative context, duration, and intensity of the impacts on the resource. The baseline (alternative D), for purposes of this impact analysis, is the continuation of personal watercraft use and current management under the existing conditions and management projections over the next 10 years. Each alternative, including the no-action alternative, is compared with this baseline to determine the relative change in resource conditions.

When quantitative information is available, the percentage change from the baseline is used as an indicator. When criteria are not applicable, standard definitions for the degree of change are used. In the absence of quantitative data, best professional judgment prevailed. In general, the thresholds established come from existing literature on personal watercraft, federal and state standards, and consultation with subject matter experts and appropriate agencies.

In addition to establishing impact thresholds, the park's resource management objectives and goals, as stated in the “Purpose of and Need for the Plan” chapter, were integrated into the impact analysis. To further define resource protection goals relative to personal watercraft management, the park's *Strategic Plan* (NPS 1998c) was used to ascertain the desired future condition of resources over the long-term. The impact analysis evaluates whether each personal watercraft management alternative would contribute substantially to the park's achievement of its resource goals or would be an obstacle to achieving the resource goal as defined by the *Strategic Plan*. The planning team considered potential ways to mitigate effects of personal watercraft on park resources and modified the alternatives accordingly.

For the purposes of analysis, the following definitions were used for evaluating the impact topics related to personal watercraft use.

Short-term impacts — Those occurring from personal watercraft use in the immediate future (per trip through a single season of use, usually 1 to 6 months).

Long-term impacts — Those occurring from personal watercraft use over several seasons of use through the next 10 years.

Direct impacts — Those occurring from the direct use or influence of personal watercraft.

Indirect impacts — Those occurring from personal watercraft use that have indirectly altered a resource or condition.

Cumulative impacts — Those occurring from continued personal watercraft use at the park when considered in context with other site-specific, local, or regional past, present, and reasonably foreseeable actions/activities that could affect the same resources or conditions, both inside and outside park boundaries.

Study area — Impacts on each resource are assessed in direct relationship to those resources affected both inside and outside the park to the extent that the impacts can be substantially traced, linked, or connected to personal watercraft use inside park boundaries. Each impact topic, therefore, has a study area relative to the resource being assessed. The study area is further defined in the methodology outlined under each impact topic.

PERSONAL WATERCRAFT USE TRENDS

Monitoring completed during 1993 and 1994 and lake use surveys conducted after 1994 indicate that personal watercraft composed 35% of the boats on the water at any one time during the summer months. In the winter months, personal watercraft use dropped to 14% of the boats on the water at any one time. This use has been fairly consistent from 1994 through the present. A survey on Lake Mead conducted on Memorial Day 1997 found that 36% of the boats on Lake Mead were personal watercraft. No comparable data are available for Lake Mohave.

According to the surveys, during peak use, which is defined as holiday weekends during the summer months, there can be approximately 870 to 1,140 personal watercraft on Lake Mead and 570 to 730 personal watercraft on Lake Mohave. During a typical summer weekend, the use ranges from 460 to 570 personal watercraft on Lake Mead and 370 to 440 personal watercraft on Lake Mohave. The prevalence of personal watercraft varies widely across zones for both lakes, with the greatest concentrations in the most developed zones.

A slight increase in use is expected during the next 10 years based on the affordability of personal watercraft and expected population increases in the region.

IMPAIRMENT ANALYSIS

The National Park Service is prohibited from impairing park resources and values as directed by the NPS *Organic Act*. NPS *Management Policies* (NPS 2001c, Section 1.4.5) state “an impairment . . . is an impact that, in the professional judgment of the responsible NPS manager, would harm the integrity of park resources or values, including the opportunities that otherwise would be present for the enjoyment of those resources or values.” Impairment to park resources and values has been analyzed within this document. An impact would be more likely to constitute an impairment to the extent that it affects a resource or value whose conservation is necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park, is the key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park, or is identified as a goal in the park’s *General Management Plan* or other relevant NPS planning documents. An impact would be less likely to constitute an impairment to the extent that it is an unavoidable result, which cannot be reasonably further mitigated, of an action necessary to preserve or restore the integrity of park resources or values.

In addition, NPS *Management Policies* state “whether an impact meets this definition depends on the particular resources and values that would be affected; the severity, duration, and timing of the impact; the direct and indirect effects of the impact; and the cumulative effects of the impact in question and other impacts.”

The determination of impairment is closely tied to the outcome of the resource impact analysis. This determination is also made with a parallel consideration of the park's legislative mandates (purpose and significance) and resource management objectives as defined in the park's *General Management Plan* (NPS 1986), *Strategic Plan* (NPS 2001b), and *Resource Management Plan* (NPS 1999c).

Impairment Analysis Related to Personal Watercraft Use

The following process was used to determine whether the various personal watercraft management alternatives would have the potential to impair park resources and values:

1. The park's *Enabling Legislation* (PL 88-639), *General Management Plan* (NPS 1986), *Strategic Plan* (NPS 2001b), and *Resource Management Plan* (NPS 1999c) were reviewed to ascertain the park's purpose and significance, resource values, and resource management goals or desired future conditions.
2. Management objectives specific to resource protection goals at the park were identified.
3. Thresholds were established for each resource of concern to determine the context, intensity, and duration of impacts, as defined above.
4. An analysis was conducted to determine if the magnitude of the impact reached the level of impairment defined in *NPS Management Policies* (NPS 2001c).

The impact analysis includes any findings of impairment to park resources and values for each of the management alternatives.

CRITERIA AND THRESHOLDS FOR IMPACT ANALYSIS

This section provides a description of the laws, regulations, and policies related to each impact topic and the methodology and thresholds used in the impact analysis. The same methodology and general criteria were used for each impact topic.

Certain impacts, such as visitor experience, are difficult to determine, and criteria have been developed through the visitor use and carrying capacity surveys that were conducted within the recreation area.

Air Quality

Laws, Regulations, and Policies. Air pollution sources within parks must comply with all federal, state, and local regulations. The regulations and policies that govern pollutants of concern from motorized vessels, including personal watercraft, are discussed briefly below.

The *Clean Air Act* established national ambient air quality standards (NAAQS) to protect the public health and welfare from air pollution. The pollutants covered by the NAAQS, called "criteria pollutants," are ozone (O₃), carbon monoxide (CO), nitrogen dioxide (NO₂), sulfur dioxide (SO₂), particulate matter (PM₁₀ and PM_{2.5}), and lead (Pb). The NAAQS are shown in table 34 in the "Affected Environment" chapter of this environmental impact statement. The *Clean Air Act* also established the Prevention of Significant Deterioration (PSD) of Air Quality Program to protect the air in relatively clean areas. One purpose of the PSD program is to preserve, protect, and enhance the air quality in national parks, national wilderness areas, national monuments, national seashores, and other areas of special national or regional natural, recreational, scenic, or historic value. The PSD provisions also include a classification approach for controlling air pollution. Class I areas are afforded the greatest degree of air quality protection. Very little deterioration of air quality is allowed in these areas. Class I areas include international parks, national wilderness areas, and national memorial parks in excess of 5,000 acres and national parks in excess of 6,000 acres that were in existence as of August 7, 1977, when the *Clean Air Act* was amended. Currently, there are 48 areas in the national park system designated as class I. Under the PSD program, the park superintendent is given an affirmative responsibility to protect visibility and all other class I area air quality-related values¹ from the adverse effects of air pollution. Furthermore, the *Clean Air Act* established a national goal of

1. A scenic, cultural, physical, biological, ecological, or recreational source that may be affected by a change in air quality.

preventing any future, and remedying any existing, human-made visibility impairments in class I areas. NPS areas that are not designated class I are class II, and the *Clean Air Act* allows only moderate air quality deterioration in these areas. In no case, however, may pollution concentrations violate any of the national ambient air quality standards.

Lake Mead National Recreation Area is designated as a class II air quality area under the *Clean Air Act*. The main purpose of this act is to protect and enhance the nation's air quality to promote public health and welfare. The act establishes specific programs to provide protection for air resources and values, including the program to prevent significant deterioration of air quality in clean air regions of the country. Although Lake Mead National Recreation Area is designated as a class II air quality area, the park strives to maintain the highest air quality standards, and project work within the recreation area is completed in accordance with regional standards. However, the recreation area does not possess sufficient autonomous authority to address issues of air quality improvements when air pollution originates outside the boundaries.

NPS *Management Policies* (Section 4.7) directs parks to seek to perpetuate the best possible air quality to preserve natural and cultural resources, sustain visitor enjoyment and human health, and preserve scenic vistas. Parks are directed to comply with all federal, state, and local air quality regulations and permitting requirements. NPS *Management Policies* further state that the National Park Service will assume an aggressive role in promoting and pursuing measures to protect air quality-related values from the adverse impacts of air pollution. In cases of doubt as to the impacts of existing or potential air pollution on park resources, the National Park Service "will err on the side of protecting air quality and related values for future generations."

The NPS *Organic Act* and *Management Policies* apply equally to all NPS-managed areas, regardless of class designation under the *Clean Air Act*. Therefore, the National Park Service will protect resources at both class I and class II designated units. Furthermore, the NPS *Organic Act* and *Management Policies* provide additional protection from that afforded by the national ambient air quality standards alone because the National Park Service has documented that specific park air quality-related values can be adversely affected at levels below the national ambient air

quality standards or by pollutants for which no national ambient air quality standards exist.

Conformity Requirements. NPS areas that do not meet the national ambient air quality standards, or whose resources already are being adversely affected by current ambient levels, require a greater degree of consideration and scrutiny by NPS managers. Areas that do not meet the national ambient air quality standards for any pollutant are designated as nonattainment areas. Section 176 of the *Clean Air Act* states that no department, agency, or instrumentality of the federal government shall engage in, support in any way, or provide financial assistance for license or permit or approve any activity that does not conform to a state implementation plan. The assurance of conformity to such a plan is the affirmative responsibility of the head of such department, agency, or instrumentality.

Essentially, federal agencies must ensure that any action taken does not interfere with a state's plan to attain and maintain the national ambient air quality standards in designated nonattainment areas. In making decisions regarding personal watercraft use within a designated nonattainment area, park managers should discuss their plans with the appropriate state air pollution control agency to determine if conformity requirements apply. Lake Mead National Recreation Area is within an attainment area for all federal criteria pollutants. Therefore, the conformity requirements are not applicable to the proposed alternative actions. However, the Las Vegas Valley portion of Clark County is classified as a nonattainment area for particulate (PM₁₀) and carbon monoxide (CO). Because of this, some alternatives consider the more conservative management strategies relating to the protection of air quality.

Applicable Emission Standards. The Environmental Protection Agency issued the gasoline marine engine final rule in August 1996, and the rule took effect in 1998 (EPA 1996a). This rule affects outboard engines and the type of inboard engines used in personal watercraft. The agency adopted a phased approach to reduce emissions. The current emission standards were set at levels that are achievable by existing marine engines, including personal watercraft. In 2006, all manufacturers will be required to meet a corporate average emission standard that is equivalent to a 75% reduction in the emission of hydrocarbons (HC). (The corporate average standard allows manufacturers to build some

engines with emission levels lower than the standard and some engines with emission levels higher than the standard; the overall corporate average must be at or below the standard.) In making the rule, the Environmental Protection Agency recognized that some increase in nitrogen oxides (NO_x) would be “technologically inevitable” if HC reductions of 75% or more are to be achieved. The emission standard in the rule is for the sum of the HC and NO_x emissions, stated as HC+NO_x. In 1996, the Environmental Protection Agency estimated an overall 52% reduction in HC+NO_x emissions from marine engines will be achieved by 2010 and a 75% reduction by 2030. The actual reduction in emissions is dependent on the sale of lower emitting marine engines. The 1997 rule delayed implementation by one year (EPA 1996a, 1997).

Given the air quality challenges in the state of California, the California Air Resources Board adopted gasoline marine engine standards that are more stringent than Environmental Protection Agency standards. These regulations were adopted in December 1998, and they apply to new marine engines manufactured for the 2001 model year and later. The regulations require manufacturers to meet a corporate average emission standard that is equivalent to a 75% reduction in HC+NO_x emissions for the 2001 model year. The 2008 model year engines would be required to have a 90% combined reduction in HC+NO_x emissions. Marine engines meeting the regulations of the California Air Resources Board in 2008 would emit only one-third as much as engines meeting the EPA standards (California EPA 2001).

Impact Indicators, Criteria, and Methodology.

Information from the literature and calculated estimates of pollutant emissions from watercraft were used to assess probable impacts on air quality. To assess the level of air quality impacts from all marine engines, including personal watercraft under each alternative, the following methods and assumptions were used:

The national ambient air quality standards and state and local air quality standards (if applicable) were examined for each pollutant.

Air quality designations for the surrounding area were determined. If the recreation area, or portion thereof, was located within the boundaries of a nonattainment area for a given pollutant, ambient air quality concentrations

were assumed to violate the national ambient air quality standards for that pollutant. Lake Mead National Recreation Area is not located within a nonattainment area.

Local ambient air quality data from monitoring sites near the recreation area (within 100 miles) were reviewed. The level and frequency of pollutant concentrations and the occurrence of any exceedances (where applicable) were ascertained. Current local conditions were assessed from interpolating regional data.

The average yearly use of motorized watercraft, including number of visits and hours of operation at the park, was determined from visitation records, launching permits, seasonal observations by park personnel, and state boating data. The principal sources of data were intercept surveys (State of Nevada 1999b) (see tables 43 and 44). Personal watercraft use in relation to overall motorized watercraft recreation at the park was extrapolated from this data and from additional data obtained by counting personal watercraft during peak and off-peak periods.

Each alternative was analyzed for years 2004 and 2012. An element of alternative B, as discussed in the “Alternatives Selected for Analysis” chapter, is that all carbureted two-stroke engines would be prohibited from the recreation area within a year of approval of the final plan. The year 2004 represents a year after the final plan and implementation of alternative B, and was selected as the first point for calculation of air quality impacts of the alternatives. Alternative C proposes that all carbureted two-stroke engines would be prohibited from the recreation area after 2012. Therefore, the year 2012 was selected as a second point for calculation of air quality impacts.

“Table 45: Annual Watercraft Population,” presents the estimated distribution of watercraft by engine type for each alternative in each of the analysis years. Assumptions made in developing table 45 include the following:

The total number of annual trips for alternative A (190,410) is based upon extrapolation of park count data. The annual trips for alternatives B, C, and D are related to the alternative A value by the relative carrying capacities for each alternative, as shown in appendix B (page 314) of this environmental impact statement, and applied to peak day use.

TABLE 43: ESTIMATED BOATING HOURS AND FUEL USED FOR MOTORIZED WATERCRAFT FOR THE 1998 BOATING SEASON^a — LAKE MEAD BOAT RAMP / MARINA SAMPLE^b

Type of Watercraft/Engine	Percent of All Boating Trips	Number of Boating Trips	Total Useage Hours	Motor Hours	Gallons of Fuel Used
<30 horsepower outboard, 2-stroke carbureted	1.8	2,982	13,846	4,392	16,754
30+ horsepower outboard, 2-stroke carbureted	4.3	7,047	38,829	18,207	60,573
Outboard gas, 4-stroke or direct-injection	9.3	15,373	65,553	44,978	158,638
Inboard/outboard gas, 4-stroke	39.0	64,155	371,881	350,213	1,506,118
Inboard gas, 4-stroke	13.3	21,961	122,263	57,595	438,924
Inboard jet gas, 4-stroke	3.0	4,896	26,320	19,530	70,801
Inboard diesel	None	None	None	None	None
Outboard/auxiliary sail	1.6	2,711	20,010	9,790	5,603
Personal watercraft gas, 2-stroke carbureted	24.0	39,447	170,009	96,474	90,334
Personal watercraft gas, 4-stroke or direct-injection	3.6	5,991	30,028	16,016	13,719
TOTAL	100	164,563	858,739	617,195	2,361,464
a. Data from the intercept survey were used to estimate the totals for Memorial Day through Labor Day weekend 1998 (State of Nevada 1999b).					
b. Includes only Nevada access sites on Lake Mead.					

TABLE 44: ESTIMATED BOATING HOURS AND FUEL USED FOR MOTORIZED WATERCRAFT FOR THE 1998 BOATING SEASON^a — LAKE MOHAVE AND COLORADO RIVER BOAT RAMP / MARINA SAMPLE^b

Type of Watercraft/Engine	Percent of All Boating Trips	Number of Boating Trips	Total Useage Hours	Motor Hours	Gallons of Fuel Used
<30 horsepower outboard, 2-stroke carbureted	1.7	381	1,910	1,336	2,769
30+ horsepower outboard, 2-stroke carbureted	9.0	2,014	8,486	5,673	15,190
Outboard gas, 4-stroke or direct-injection	2.3	508	2,466	1,687	5,376
Inboard/outboard gas, 4-stroke	19.8	4,439	20,825	15,521	67,473
Inboard gas, 4-stroke	5.7	1,253	8,466	6,742	39,198
Inboard jet gas, 4-stroke	6.2	1,395	3,783	3,399	11,652
Inboard diesel	None	None	None	None	None
Outboard/auxiliary sail					
Personal watercraft gas, 2-stroke carbureted	46.5	10,425	39,377	25,979	141,363
Personal watercraft gas, 4-stroke or direct-injection	8.8	1,973	10,987	9,527	39,443
TOTAL	100	22,388	96,300	69,864	322,464
a. Data from the intercept survey were used to estimate the totals for Memorial Day through Labor Day weekend 1998 (State of Nevada 1999b).					
b. Includes only Nevada access sites on Lake Mohave and the Colorado River below Davis Dam.					

TABLE 45: ANNUAL WATERCRAFT POPULATION

Alternative A – No Action, personal watercraft prohibited ¹								
Watercraft and Engine Type	Lake Mead				Lake Mohave			
	2004	2012	2004	2012	2004	2012	2004	2012
	Percent of Trips ²	Number of Trips	Percent of Trips ²	Number of Trips	Percent of Trips ²	Number of Trips	Percent of Trips ²	Number of Trips
Outboard Engines								
Carbureted 2-stroke ³	6.6	12,568	3.5	6,669	18.8	25,838	9.973	13,710
Direct injection 2-stroke	3.7	7,009	4.5	8,484	2.6	3,527	4.771	6,559
Electric fuel injection 2-stroke	3.7	7,009	4.5	8,484	2.6	3,527	4.771	6,559
Carburetor or EFI 4-stroke	7.4	14,017	8.9	16,967	5.1	7,054	9.543	13,118
Inboard/Stern drive								
Carburetor or EFI 4-stroke	72.3	137,648	72.3	137,648	57.0	78,324	56.977	78,324
Inboard jet gas, 4-stroke ⁴	4.1	7,826	4.1	7,826	14.0	19,196	13.964	19,196
Outboard/Auxiliary Sail⁵	2.3	4,333	2.3	4,333	0.0	0	0.000	0
Personal Watercraft							0.000	
Carbureted 2-stroke ³	0.0	0	0.0	0	0.0	0	0.000	0
Direct injection 2-stroke	0.0	0	0.0	0	0.0	0	0.000	0
4-stroke	0.0	0	0.0	0	0.0	0	0	0
Total	100	190,410	100	190,410	100	137,466	100	137,466
Alternative A – total trips = 190,410 + 137,466 = 327,876								
<p>Notes:</p> <p>Loading to water and threshold volume calculations are presented in “Appendix G: Approach to Evaluating Surface Water Quality Impacts” and “Appendix H: Results of Surface Water Quality Evaluation.”</p> <p>1. The alternative descriptions are limited to the elements that influence the distribution of trips among the types of watercraft and engines. The total number of trips is a function of the differences in carrying capacity among the alternatives.</p> <p>2. Percent trips from Hagler-Bailley 1998 survey data (used in Phasing-Distribution).</p> <p>3. Calculations for carbureted 2-stroke outboard engines and carbureted 2-stroke personal watercraft engines followed the formula found in above-referenced appendix G under “All other engine types.”</p> <p>4. Inboard Jet Gas, 4-stroke engines were assumed to be equivalent to 4-stroke personal watercraft.</p> <p>5. Outboard/Auxiliary sail engines assumed to be carbureted 4-stroke outboards.</p>								

Alternative B – Carbureted two-stroke engines prohibited one year after final plan ¹					Alternative B – Carbureted two-stroke engines prohibited one year after final plan ¹			
Lake Mead					Lake Mohave			
Watercraft and Engine Type	2004		2012		2004		2012	
	Percent of Trips ²	Number of Trips	Percent of Trips ²	Number of Trips	Percent of Trips ²	Number of Trips	Percent of Trips ²	Number of Trips
Outboard Engines								
Carbureted 2-stroke ³	0.0	0	0.0	0	0.0	0	0.0	0
Direct injection 2-stroke	3.9	7,099	3.9	7,099	3.2	4,148	3.2	4,148
Electric fuel injection 2-stroke	3.9	7,099	3.9	7,099	3.2	4,148	3.2	4,148
Carburetor or EFI 4-stroke	7.7	14,198	7.7	14,198	6.5	8,295	6.5	8,295
Inboard/Stern drive								
Carburetor or EFI 4-stroke	52.3	96,269	52.3	96,269	25.4	32,529	25.4	32,529
Inboard jet gas, 4-stroke ⁴	3.0	5,473	3.0	5,473	6.2	7,972	6.2	7,972
Outboard/Auxiliary Sail⁵	1.6	3,031	1.6	3,031	0.0	0	0.0	0
Personal Watercraft								
Carbureted 2-stroke ³	0.0	0	0.0	0	0.0	0	0.0	0
Direct injection 2-stroke	13.8	25,398	13.8	25,398	27.7	35,426	27.7	35,426
4-stroke	13.8	25,398	13.8	25,398	27.7	35,426	27.7	35,426
Total	100	183,965	100	183,965	100	127,944	100	127,944
Alternative B – total trips = 183,965 + 127,944 = 311,907								
Notes:								
Loading to water and threshold volume calculations are presented in “Appendix G: Approach to Evaluating Surface Water Quality Impacts” and “Appendix H: Results of Surface Water Quality Evaluation.”								
1. The alternative descriptions are limited to the elements that influence the distribution of trips among the types of watercraft and engines. The total number of trips is a function of the differences in carrying capacity among the alternatives.								
2. Percent trips from Hagler-Bailley 1998 survey data (used in Phasing-Distribution).								
3. Calculations for carbureted 2-stroke outboard engines and carbureted 2-stroke personal watercraft engines followed the formula found in above-referenced appendix G under “All other engine types.”								
4. Inboard Jet Gas, 4-stroke engines were assumed to be equivalent to 4-stroke personal watercraft.								
5. Outboard/Auxiliary sail engines assumed to be carbureted 4-stroke outboards.								

Alternative C – Carbureted two-stroke engines prohibited after 2012¹								
Watercraft and Engine Type	Lake Mead				Lake Mohave			
	2004		2012		2004		2012	
	Percent of Trips²	Number of Trips	Percent of Trips²	Number of Trips	Percent of Trips²	Number of Trips	Percent of Trips²	Number of Trips
Outboard Engines								
Carbureted 2-stroke ³	4.8	8,865	0.0	0	8.4	11,502	0.0	0
Direct injection 2-stroke	2.7	4,944	3.9	7,160	1.1	1,570	3.2	4,446
Electric fuel injection 2-stroke	2.7	4,944	3.9	7,160	1.1	1,570	3.2	4,446
Carburetor or EFI 4-stroke	5.3	9,888	7.7	14,321	2.3	3,140	6.5	8,891
Inboard/Stern drive							0.0	0
Carburetor or EFI 4-stroke	52.3	97,097	52.3	97,097	25.4	34,867	25.4	34,867
Inboard jet gas, 4-stroke ⁴	3.0	5,520	3.0	5,520	6.2	8,545	6.2	8,545
Outboard/Auxiliary Sail⁵	1.6	3,057	1.6	3,057	0.0	0	0.0	0
Personal Watercraft								
Carbureted 2-stroke ³	18.8	34,870	0.0	0	36.5	50,065	0.0	0
Direct injection 2-stroke	4.4	8,181	13.8	25,616	9.4	12,940	27.7	37,972
4-stroke	4.4	8,181	13.8	25,616	9.4	12,940	27.7	37,972
Total	100	185,548	100	185,548	100	137,138	100	137,138
Alternative C – total trips = 185,548 + 137,138 = 322,686								
<p>Notes:</p> <p>Loading to water and threshold volume calculations are presented in "Appendix G: Approach to Evaluating Surface Water Quality Impacts" and "Appendix H: Results of Surface Water Quality Evaluation."</p> <p>1. The alternative descriptions are limited to the elements that influence the distribution of trips among the types of watercraft and engines. The total number of trips is a function of the differences in carrying capacity among the alternatives.</p> <p>2. Percent trips from Hagler-Bailley 1998 survey data (used in Phasing-Distribution).</p> <p>3. Calculations for carbureted 2-stroke outboard engines and carbureted 2-stroke personal watercraft engines followed the formula found in above-referenced appendix G under "All other engine types."</p> <p>4. Inboard Jet Gas, 4-stroke engines were assumed to be equivalent to 4-stroke personal watercraft.</p> <p>5. Outboard/Auxiliary sail engines assumed to be carbureted 4-stroke outboards.</p>								

ENVIRONMENTAL CONSEQUENCES

Where certain types of watercraft or engines would be prohibited, park visitors with other types of watercraft or engines would use the lakes, and the annual trip volume would not be changed.

Under alternative D, there would be no park restrictions on the number of personal watercraft or the type of engine used in any watercraft. Therefore, alternative D is the baseline case for air quality impact analysis. For the calculation of emissions, it was assumed that carbureted two-stroke engines in personal watercraft and outboards would be replaced by other types of engines at the rate projected by the Environmental Protection Agency in their forecast of the effects of the rule requiring the phase-out of carbureted two-stroke engines. Based on the EPA data, it was assumed that 21.6% of the carbureted two-stroke engines in use in 1998 would have been replaced by 2004, and that 58.4% would have been replaced by 2012.

For alternative A, the prohibited personal watercraft trips would be distributed proportionally among all other watercraft types. Carbureted two-stroke outboard engines would be replaced proportionally with the other types of outboard engines.

For alternatives B and C, carbureted two-stroke outboard engines would be replaced proportionally with the other types of outboard engines and carbureted two-stroke personal watercraft engines would be replaced proportionally with the other types of personal watercraft engines.

The difference between alternatives B and C would be in the timing of the conversion of carbureted two-stroke engines to cleaner marine engines (direct-injection two-stroke and four-stroke engines). In alternative B, all carbureted two-stroke engines would be prohibited from the park in 2004 and subsequent years. In alternative C, all carbureted two-stroke engines would be prohibited from the park in 2012 and subsequent years, and there would be no restrictions on engine types prior to 2012.

The rated horsepower, average engine load, and other relevant parameters for each watercraft type were taken from default assumptions in the EPA NONROAD model. This model is used to calculate emissions of criteria pollutants from the operation of nonroad spark-ignition type engines, including personal watercraft. The model allows assumptions to

be made regarding the mix of engine types that would be phased in as new engine standards come into effect, and increasing numbers of personal watercraft would be of the cleaner-burning four-stroke type and the direct-injection two-stroke type. Model elements include the following:

The HC emission factors (such as emissions of pollutant per horsepower-hour) for direct-injection two-stroke engines are approximately one-half of the emission factors for carbureted two-stroke engines; the HC emission factors for four-stroke engines are less than 10% of the emission factors for carbureted two-stroke engines. The HC emission factors for carbureted two-stroke outboard engines are less than for two-stroke personal watercraft engines

Total hydrocarbon emissions comprise approximately 100% of the volatile organic compounds (VOC) for two-stroke engines and 93% of the VOC for four-stroke engines (EPA 1997; EPA 2000).

No engine degradation or non-exhaust HC emissions were considered in the emission estimates. Non-exhaust HC emissions from watercraft are less than exhaust emissions but are not negligible. For watercraft, the principal sources of non-exhaust emissions are evaporative emissions from fuel tanks when the engine is not in use and refueling emissions. The quantities of these emissions are related to the number of pieces of equipment, number of trips, and watercraft fuel tank volume. The elements of the four alternatives of the *Lake Management Plan* that relate to watercraft types would change engine types, with significant variations in exhaust emissions. Fuel tank volumes would not be anticipated to change significantly. The number of trips per year would vary by 5%, at the most, between alternatives. Therefore, non-exhaust emissions would be very similar for all four alternatives, and the inclusion of these emissions would not change the impact analysis, which compares emissions to the baseline (alternative D). In July 2002, the Environmental Protection Agency proposed new evaporative emissions standards for gasoline-fueled boats and personal watercraft. These proposed standards would require most new boats produced in 2008 or later to be equipped with low-emission fuel tanks or other evaporative emission controls.

The estimated emissions under alternatives A, B, and C are compared with the baseline (Alternative D), which is the condition that would occur if the carbureted two-stroke marine engines would convert to the cleaner types over time solely with the implementation of the EPA 2006 regulation.

Ozone injury on sensitive plants found in the recreation area was assessed from regional biomonitoring data provided by the U.S. Forest Service Forest Health Biomonitoring Program (Forest Service 1999; pers. comm. from Roger Boyer to Parsons, 2002).

A calculation referred to as SUM06 (ppm-hours) was used for ozone. The highest three-month, five-year average commonly used for the area was determined by reviewing ambient air quality data (available from the National Park Service Air Resources Division). The impacts on air quality under the four alternatives were assessed by considering the existing air quality levels and the air quality-related values present and by using the estimated emissions and any applicable, EPA-approved air quality models.

Air Quality Impact Thresholds. Impact thresholds for air quality are dependent on the type of pollutants produced, the background air quality, and the resources in the environment that may be affected by airborne pollutants (air quality-related values). Impact thresholds may be qualitative, such as photos of degraded visibility. They also can be quantitative, based on impacts on air quality-related values or federal air quality standards, or emissions based on emission factor models. The type of thresholds used in the analysis depends on what type of information is appropriate or available.

The Environmental Protection Agency has established standards that are regulated by states to protect human health and the environment. Two categories for potential airborne pollution impacts from personal watercraft are analyzed: impacts on human-health resources and impacts on air quality-related values in the study area. Thresholds for each impact category (negligible, minor, moderate, and major) are discussed for each impact topic.

Impact to Human Health from Airborne Pollutants

The following impact thresholds for an attainment area have been defined for analyzing impacts to human health from these airborne pollutants: carbon monoxide (CO), particulate matter (PM₁₀ and PM_{2.5}),

hydrocarbon (HC), nitrogen oxides (NO_x) and ozone (O₃). O₃ is analyzed by examination of the precursor HC and NO_x pollutants. Sulfur oxides and lead are not included because they are emitted by personal watercraft in very small quantities.

	Activity Analyzed		Current Air Quality
<i>Negligible:</i>	Emission levels would be less than 50 tons per year for each pollutant.	and	The first highest three-year maximum for each pollutant is below (less than 60%) the national ambient air quality standards (NAAQS).
<i>Minor:</i>	Emission levels would be less than 100 tons per year for each pollutant.	and	The first highest three-year maximum for each pollutant is below (less than 80%) the NAAQS.
<i>Moderate:</i>	Emission levels would be greater than or equal to 100 tons per year for any pollutant.	or	The first highest three-year maximum for each pollutant is greater than 80% of the NAAQS.
<i>Major:</i>	Emission levels would be greater than or equal to 250 tons per year for any pollutant.	and	The first highest three-year maximum for each pollutant is greater than 80% of the NAAQS.

Impacts to Air Quality-Related Values from Pollutants

Impacts on environmental resources and values include visibility and biological resources (specifically ozone effects on plants) that may be affected by airborne pollutants emitted from personal watercraft and other sources. These pollutants include O₃, NO_x, HC, and particulate matter. Particulate matter and NO_x emissions are evaluated for visibility impairment. Both HC and NO_x are ozone precursors in the presence of sunlight and are evaluated separately in lieu of ozone, which is formed as a secondary pollutant.

To assess the impact of ozone on plants, the five-year ozone index value was calculated and is represented as SUMO6. National SUMO6 values have been developed by the National Park Service Air Resources Division.

	Activity Analyzed		Current Air Quality
<i>Negligible:</i>	Emissions would be less than 50 tons/year for each pollutant.	and	There are no perceptible visibility impacts (photos or anecdotal evidence). and There is no observed ozone injury on plants. and SUM06 ozone is less than 12 ppm-hour.
<i>Minor:</i>	Emissions would be less than 100 tons per year for each pollutant.	and	SUM06 ozone is less than 15 ppm-hour.
<i>Moderate:</i>	Emissions would be greater than 100 tons per year for any pollutant; or Visibility impacts from cumulative personal watercraft emissions would be likely (based on past visual observations).	or	Ozone injury symptoms are identifiable on plants. and SUM06 ozone is less than 25 ppm-hour.
<i>Major:</i>	Emissions would be equal to 250 tons per year for any pollutant; or Visibility impacts from cumulative personal watercraft emissions would be likely (based on modeling or monitoring).	and	Ozone injury symptoms are identifiable on plants. or SUM06 ozone is greater than 25 ppm-hour.

Impairment. Impairment is defined as impacts that

have a major adverse effect on park resources and values

contribute to deterioration of the park's air quality to the extent the park's purpose could not be fulfilled as established in its enabling legislation

affect resources key to the park's natural or cultural integrity or opportunities for enjoyment or

affect a resource's conservation goal as identified in the park's *General Management Plan* or other park planning documents

Geologic Resources and Soils

Laws, Regulations, and Policies. NPS *Management Policies* (NPS 2001c, Section 4.8) stipulate that the National Park Service will preserve and protect geologic resources as integral components of park natural systems. Geologic resources include geologic features and geologic processes. The fundamental policy, as stated in the *NPS-77: Natural Resources Management Guidelines* (NPS 1991), is the preservation of the geologic resources of parks in their natural condition whenever possible.

Soil resources will be protected by preventing or minimizing adverse potentially irreversible impacts on soils in accordance with NPS *Management Policies*. NPS-77 (NPS 1991) specified objectives for each management zone for soil resources management. These management objectives are defined as:

Natural zone — Preserve natural soils and the processes of soil genesis in a condition undisturbed by humans.

Cultural zone — Conserve soil resources to the extent possible consistent with maintenance of the historic and cultural scene and prevent soil erosion wherever possible.

Park development zone — Ensure developments and their management are consistent with soil limitations and soil conservation practices.

Special use zone — Minimize soil loss and disturbance caused by special use activities, and ensure soils retain their productivity and potential for reclamation.

Zones within the recreation area have been designated in the *Lake Mead National Recreation Area General Management Plan*, which provides the overall guidance and management direction for Lake Mead National Recreation Area.

Impact Indicators, Criteria, and Methodology.

Development site plans are not in place for the expansion zones proposed in the *General Management Plan*. At this time, only general estimates of soil disturbance can be derived from the available information. As site plans are developed, a more detailed environmental analysis would occur for each development zone.

Negligible — Impacts have no measurable or perceptible changes in soil structure and occur in a relatively small area.

Minor — Impacts are measurable or perceptible, but localized in a relatively small area. The overall soil structure is not affected.

Moderate — Impacts are localized and small in size, but cause a permanent change in the soil structure in that particular area.

Major — Impacts to the soil structure are substantial, highly noticeable, and permanent.

Impairment — For this analysis, impairment is considered a permanent change in a large portion of the overall acreage of the park, affecting the resource to the point that the park's purpose could not be fulfilled and the resource is degraded, precluding the enjoyment of future generations.

Water Resources

Laws, Regulations, and Policies. The *Clean Water Act* and supporting criteria and standards promulgated by the Environmental Protection Agency, the Nevada Department of Environmental Protection (NDEP), and the Arizona Department of Environmental Quality (ADEQ) are used at Lake Mead National Recreation Area to protect water quality and its beneficial uses, including human health, health of the aquatic ecosystem, and recreational use.

A primary means for protecting water quality under the *Clean Water Act* is the establishment,

implementation, and enforcement of water quality standards. Generally, the federal government has delegated the development of standards to the individual states subject to EPA approval (EPA 1992). Water quality standards consist of three components: the designated beneficial uses of a water body, such as aquatic life, cold water fishery, or body contact recreation (i.e., swimming or wading); the numerical or narrative criteria that defines the limits of the physical, chemical, and biological characteristics of water that are sufficient to protect the beneficial uses; and an antidegradation provision to protect the existing uses and quality of water. [In addition, the National Park Service complies with section 313 of the Clean Water Act, Federal Facilities Pollution Control.](#)

Water quality criteria developed to protect specific uses are updated periodically by the Environmental Protection Agency. New and revised criteria are published in the *Federal Register* and summarized periodically in *Water Quality Criteria* (EPA 1998). *Water Quality Criteria*, also known as the “Gold Book,” recommends criteria for a state's water quality standards (table 46). The criteria are almost always adopted by states as a portion of their standards, and they represent the minimum level of protection afforded to the waterbodies of a state.

A state's antidegradation policy is a three-tiered approach for maintaining and protecting various levels of water quality. In tier 1 waters, the existing uses of a water body and the quality necessary to protect those uses must be maintained. This is considered the base level of protection that must be applied to the water body. If the water quality in a water body already exceeds the minimum requirements for the protection of the designated uses (tier 2), the existing water quality must be maintained. The third level provides protection for the state's highest quality waters or where ordinary use classification may not suffice; these water bodies are tier 3 waters and are classified as outstanding national resource waters. In tier 3 waters, the existing water quality must be maintained and protected. Lakes Mead and Mohave are tier 1 waterbodies.

**TABLE 46: NATIONAL RECOMMENDED WATER QUALITY CRITERIA FOR PRIORITY TOXIC POLLUTANTS
FEDERAL REGISTER VOLUME 63, NUMBER 237, DECEMBER 10, 1998**

Priority Pollutant	Limits for Human Consumption (micrograms/liter)	
	Water + organism	Organism only
Benzene	1.2 ^{a,b}	71 ^{a,b}
Ethylbenzene	3,100 ^{a,c}	29,000 ^a
Toluene	6,800 ^{a,c}	200,000 ^a
Acenaphthene	1,200 ^{a,d}	2,700 ^{a,d}
Acenaphthylene	None	None
Anthracene	9,600 ^a	110,000 ^a
Benzo(a)Anthracene	0.0044 ^{a,b}	0.049 ^{a,b}
Benzo(a)Pyrene	0.0044 ^{a,b}	0.049 ^{a,b}
Benzo(b)Fluoranthene	0.0044 ^{a,b}	0.049 ^{a,b}
Benzo(ghi)Perylene	None	None
Benzo(k)Fluoranthene	0.0044 ^{a,b}	0.049 ^{a,b}
Chrysene	0.0044 ^{a,b}	0.049 ^{a,b}
Dibenzo(a), (h)Anthracene	0.0044 ^{a,b}	0.049 ^{b,d}
Fluoranthene	300 ^a	370 ^a
Fluorene	1,300 ^a	14,000 ^a
Ideno 1,2,3-cdPyrene	0.0044 ^{a,b}	0.049 ^{a,b}
Naphthalene	None	None
Phenanthrene	None	None
Pyrene	960 ^a	11,000 ^a
<p>a. This criterion has been revised to reflect the Environmental Protection Agency q1* or RfD, as contained in the integrated risk information system as of April 8, 1998. This fish tissue bioconcentration factor (BCF) from the 1980 <i>Ambient Water Quality Criteria</i> (EPA 1980) document was retained in each case.</p> <p>b. This criterion is based on carcinogenicity of 10⁻⁶ risk. Alternate risk factors may be obtained by moving the decimal point.</p> <p>c. A more stringent maximum contaminant level has been issued by the Environmental Protection Agency. Refer to drinking water regulations (40 CFR 141) or Safe Drinking Water Hotline (1-800-426-4791) for values.</p> <p>d. The organoleptic effect criterion is more stringent than the value for the priority toxic pollutants.</p>		

Water quality standards are primarily achieved by controlling the pollutants permitted in point source discharges into receiving waters through national pollutant discharge elimination system (NPDES) permits (*Clean Water Act* [CWA] 1987, Section 402), implementing best management practices for nonpoint sources of pollution and limiting the total maximum daily loads on water bodies that have chronic and persistent violations of water quality standards (CWA 1987, Section 303d). The objective of setting total maximum daily loads is to bring the quality-impaired waterbody into compliance with

water quality standards by allocating allowable pollutant loads among different point and nonpoint sources of pollution.

Water quality in Lake Mead is regulated by the Nevada Department of Environmental Protection under water quality standards and regulations that are promulgated in the *Nevada Administrative Code* (NAC, Chapter 445A.119–445A.225) (see “Appendix I: Comparison of Nevada and Arizona Water Quality Standards”). Consistent with federal regulations, Nevada has established numerical and

narrative standards that protect existing and designated uses of state waters and implement the antidegradation requirements by establishing “requirements to maintain existing higher quality.” Compliance with the numerical standards for water quality is determined at control points that are specified in the regulations.

The Nevada Department of Environmental Protection has divided the administration of water quality management in Lake Mead into two discreet units divided by a control point near the confluence of Las Vegas Wash and Lake Mead. Standards for the portion of Lake Mead from the western boundary of Las Vegas Marina Campground to the confluence of Las Vegas Wash are generally less strict than for the rest of Lake Mead to accommodate pollution from wastewater discharges and urban runoff from the city of Las Vegas. Requirements to maintain existing higher water quality in Lake Mead have been established by the Nevada Department of Environmental Protection east of the Las Vegas Wash control point for a few physical and chemical water quality parameters, including temperature, pH, chlorophyll a, total dissolved solids, nitrogen, turbidity, and color.

Title 18, chapter 11 of the Arizona Administrative Code lists the Arizona Department of Environmental Quality water quality standards (ADEQ 1996). The standards establish water quality criteria for the waters of Arizona and designated uses for surface waters, including Lakes Mead and Mohave. The designated uses of these lakes are aquatic and wildlife, full body contact, domestic water source, fish consumption, agricultural irrigation, and livestock watering.

Maximum contaminant levels for drinking water are developed under the *Safe Drinking Water Act*. These national primary drinking water regulations, for which states have primary enforcement responsibility, are updated periodically by the Environmental Protection Agency. New and revised standards are published in the *Federal Register*. These standards are applicable to finished drinking water that has undergone treatment processes.

The *Lake Mead National Recreation Area Resource Management Plan* (NPS 1999c) identifies internal threats to water resources, including heavy recreation use in coves (from excrement and littering) and water quality in harbors (from illegal sewage discharge and petrochemical spills). External threats include materials transported to the lakes by outside sources,

air pollutants dropping into the lakes, and adjacent land uses and increasing development.

Impact Indicators, Criteria, and Methodology.

The best available information from the most recent literature was used to develop impact thresholds. Scientists and specialists from within and outside the National Park Service were consulted. Dilution is also a consideration. The volume of water in Lake Mead is 27-million acre-feet at full pool (1,221 feet above mean sea level). Lake Mohave has a volume of 1.81-million acre-feet at full pool (647 feet above mean sea level). Impacts can be evaluated based on the potential for dilution lakewide and in coves where use is concentrated. Flushing rates were not used to determine impacts since most of the impacts from motorized vessels occur on a short-term localized basis due to their volatile nature, their tendency to settle out, or their ability to be degraded.

The following fuel components are discharged by motorized vessels to the receiving water: benzene, toluene, ethyl benzene, xylene (collectively called BTEX) and methyl tertiary butyl ether (MTBE). Very few polycyclic aromatic hydrocarbons (PAH) are discharged into the water as part of the unburned fuel; many more are discharged as part of the exhaust from engine combustion. All boats discharge PAH through the exhaust. Because of its chemical characteristics, BTEX readily transfers from the water to air, whereas PAH generally do not.

PAH molecules contain two to seven benzene rings. Their environmental fate, persistence, and toxicity are related to this molecular structure and to the number and configuration of attached alkyl groups (such as methyl [CH₃-] or ethyl [CH₃CH₂-] groups). The smaller and lighter (i.e., two- and three-ringed) compounds are generally more water soluble, more biodegradable, and more volatile. Their solubility makes them more bioavailable (and therefore more of a risk) to aquatic life, but their low persistence also reduces exposure times. PAH in unburned (petrogenic) two-stroke fuel mixture are rare, with the possible exception of naphthalene, acenaphthene, and perhaps others. There are no EPA water quality criteria for the protection of aquatic life for the personal watercraft-related contaminants (EPA 1999). There are, however, a limited number of EPA criteria for the protection of human health (via ingestion of water and aquatic organisms or ingestion of aquatic organisms only).

Water management agencies often selectively draw water from depths below those where the highest

concentrations of gasoline compounds are found. Benzene is less dense than water, so will float; the deeper the intake for any water treatment plant, the less chance there is of drawing in benzene-contaminated water and having it enter the drinking water supply. The water intake that delivers drinking water for the Las Vegas Valley is located at an elevation 1,050 feet above mean sea level in Lake Mead, and the elevation of the lake surface is usually above 1,180 feet. This puts the water intake at a depth of 130 feet or more. Gasoline compounds have not been detected in the water samples regularly taken near the water intake by staff of the Southern Nevada Water System.

Section 304(a)(1) of the *Clean Water Act* requires the Environmental Protection Agency to develop and publish criteria for water quality that accurately reflects the latest scientific knowledge. Water quality criteria developed under section 304(a) are based solely on data and scientific judgment related to the relationship between pollutant concentrations and their effects on the environment and human health. If no criteria are listed for a pollutant, then the Environmental Protection Agency does not have any national recommended water quality criteria.

In addition to the federal regulations, the states of Nevada and Arizona have criteria related to water quality. These criteria or reference for these criteria are found in appendix I.

Assumptions for Evaluating Impacts from Marine Engines, Including Personal Watercraft Use. To assess the magnitude of the impacts of all vessels on the water quality of park waters under the four management alternatives, several assumptions were made:

The implementing regulations for the *Clean Water Act*, found at 40 CFR 131.12, represent an overall goal or principle with regard to all vessels. The park will strive to fully protect water quality so that “fishable/swimmable” uses and other existing uses are maintained, and therefore, it could not authorize motorized vessels, including personal watercraft, for use to the degree it would lower water quality and affect these existing uses. To do so would potentially violate 40 CFR 131.10, which forbids the removal of an existing use because another activity was authorized when it was known this activity would lower the water quality below the limit set for existing uses.

State water quality standards governing the waters of the park were examined, the classification of park waters by the state was defined, and the overall sources of water pollutants, both internal and external to park boundaries, were identified in relation to these standards and classification.

State water quality standards were also examined for pollutants whose concentrations in gasoline were available in the literature and for which ecological and/or human health toxicity benchmarks were available in the literature. The state of Arizona has established water quality standards for designated uses, including fish consumption. The fish consumption standard for benzo(a)pyrene of 0.002 µg/L was used for the calculation of water quality impacts since it is more protective than the EPA human health benchmark of 0.0044 µg/L. EPA ecotoxicological and human health benchmarks for the remainder of the pollutants were used in calculation of water quality impacts, as they were more protective than either Nevada or Arizona water quality standards.

Each alternative is analyzed for years 2004 and 2012. As discussed under alternative B, in the “Alternatives Selected for Analysis” chapter, all carbureted two-stroke engines would be prohibited from the recreation area within a year of the final plan. The year 2004 represents a year after the final plan and the implementation of alternative B, and was selected as the first point for comparison of water quality impacts of the alternatives. Alternative C proposes that all carbureted two-stroke engines would be prohibited from the recreation area after 2012. Therefore, the year 2012 was selected as a second point for calculation of water quality impacts.

The average yearly use of motorized watercraft, including number of visits and hours of operation at the park, was determined from visitation records, launching permits, seasonal observations by park personnel, and state boating data. The principal sources of data were intercept surveys (State of Nevada 1999b). Personal watercraft use in relation to overall motorized watercraft recreation at the park was extrapolated from this data and from additional data obtained by counting personal watercraft during peak and off-peak periods.

The resulting 1998 distribution of boating hours for Lakes Mead and Mohave are found in tables 47 and 48, respectively. This distribution

TABLE 47: ESTIMATED BOATING HOURS AND FUEL USED FOR MOTORIZED WATERCRAFT FOR THE 1998 BOATING SEASON^a — LAKE MEAD BOAT RAMP / MARINA SAMPLE^b

Type of Watercraft/Engine	Percent of All Boating Trips	Number of Boating Trips	Total Useage Hours	Engine Hours	Gallons of Fuel Used
<30 horsepower outboard, 2-stroke carbureted	1.8	2,982	13,846	4,392	16,754
30+ horsepower outboard, 2-stroke carbureted	4.3	7,047	38,829	18,207	60,573
Outboard gas, 4-stroke or direct-injection	9.3	15,373	65,553	44,978	158,638
Inboard/outboard gas, 4-stroke	39.0	64,155	371,881	350,213	1,506,118
Inboard gas, 4-stroke	13.3	21,961	122,263	57,595	438,924
Inboard jet gas, 4-stroke	3.0	4,896	26,320	19,530	70,801
Inboard diesel	None	None	None	None	None
Outboard/auxiliary sail	1.6	2,711	20,010	9,790	5,603
Personal watercraft gas, 2-stroke carbureted	24.0	39,447	170,009	96,474	90,334
Personal watercraft gas, 4-stroke or direct-injection	3.6	5,991	30,028	16,016	13,719
TOTAL	100	164,563	858,739	617,195	2,361,464
a. Data from the intercept survey were used to estimate the totals for Memorial Day through Labor Day weekend 1998 (State of Nevada 1999b).					
b. Includes only Nevada access sites on Lake Mead.					

TABLE 48: ESTIMATED BOATING HOURS AND FUEL USED FOR MOTORIZED WATERCRAFT FOR THE 1998 BOATING SEASON^a — LAKE MOHAVE AND COLORADO RIVER BOAT RAMP / MARINA SAMPLE^b

Type of Watercraft/Engine	Percent of All Boating Trips	Number of Boating Trips	Total Useage Hours	Engine Hours	Gallons of Fuel Used
<30 horsepower outboard, 2-stroke carbureted	1.7	381	1,910	1,336	2,769
30+ horsepower outboard, 2-stroke carbureted	9.0	2,014	8,486	5,673	15,190
Outboard gas, 4-stroke or direct-injection	2.3	508	2,466	1,687	5,376
Inboard/outboard gas, 4-stroke	19.8	4,439	20,825	15,521	67,473
Inboard gas, 4-stroke	5.7	1,253	8,466	6,742	39,198
Inboard jet gas, 4-stroke	6.2	1,395	3,783	3,399	11,652
Inboard diesel	None	None	None	None	None
Outboard/auxiliary sail					
Personal watercraft gas, 2-stroke carbureted	46.5	10,425	39,377	25,979	141,363
Personal watercraft gas, 4-stroke or direct-injection	8.8	1,973	10,987	9,527	39,443
TOTAL	100	22,388	96,300	69,864	322,464
a. Data from the intercept survey were used to estimate the totals for Memorial Day through Labor Day weekend 1998 (State of Nevada 1999b).					
b. Includes only Nevada access sites on Lake Mohave and the Colorado River below Davis Dam.					

of boating use expressed in hours of use by engine type was used as baseline data in the analysis.

As discussed earlier, table 45 was developed by estimating the distribution of watercraft by engine type for each alternative in each of the analysis years. The assumptions made in developing table 49 below include the following:

The boating capacity, expressed as “boats at any one time,” or BAOT, varies between alternatives. Appendix B presents the analysis of boating capacity. The percent of trips that are shown in table 45 for each alternative was multiplied by the corresponding BAOT for each alternative and the hours per trip to yield the boating hours required for analysis.

For alternative A, the prohibited personal watercraft trips would be distributed proportionally among all other watercraft types. Carbureted two-stroke outboard engines would be replaced proportionally with the other types of outboard engines. Based on the EPA rule, “Final Rule for New Gasoline Spark-Ignition Marine Engines” (EPA 1996a), it was assumed that 21.6% of the remaining carbureted two-stroke engines in use in 1998 would have been replaced by 2004, and that 58.4% would have been replaced by 2012.

For alternatives B and C, carbureted two-stroke outboard engines would be replaced proportionally with the other types of outboard engines and carbureted two-stroke personal watercraft engines would be replaced proportionally with the other types of personal watercraft engines.

The difference between alternatives B and C would be in the timing of the conversion of

carbureted two-stroke engines to cleaner marine engines (four-stroke or two-stroke direct-injection engines).

Under alternative B, all carbureted two-stroke engines would be prohibited from the park in 2004 and subsequent years. In alternative C, all carbureted two-stroke engines would be prohibited from the park in 2012 and subsequent years.

Under alternative D, there would be no park restrictions on the number of personal watercraft or the type of engine used in any watercraft. Therefore, alternative D is the baseline case for water quality impact analysis. It was assumed that carbureted two-stroke engines in personal watercraft and outboard engines would be converted to cleaner marine engines using the EPA rule described above.

An approach was developed to provide estimates of whether personal watercraft and outboard motor use over a particular time (for example, over a typical busy weekend day) would result in exceedances of the identified standards, criteria, or toxicity benchmarks. The approach is described in “Appendix G: Approach to Evaluating Surface Water Quality Impacts.” The results of this approach were then taken into account, along with site-specific information about mixing, wind, and turbidity, as well as the specific fate and transport characteristics of the pollutant involved (e.g., volatility), to assess the potential for the occurrence of adverse water quality impacts.

The pollutant loadings estimated under this approach used extreme adverse conditions, including the minimum pool size for each lake; the most shallow thermocline (30 feet); and boat capacity levels that would only be found during the heaviest use period on a normal size lake pool.

TABLE 49: BAOT (BOATS AT ANY ONE TIME) FOR ALL ALTERNATIVES

	BAOT for Lake Mead	BAOT for Lake Mohave	Total BAOT
Alternative A	4,201	1,774	5,975
Alternative B	3,000	1,393	4,393
Alternative C	3,295	1,760	5,055
Alternative D	3,739	2,061	5,800

The approach provides the information needed to calculate emissions to the receiving waterbody from personal watercraft (and by estimation, from other watercraft types) of selected hydrocarbons whose concentrations in the raw gasoline fuel were available in the literature and for which ecotoxicological and/or human health toxicity benchmarks could be acquired from the literature. The selected chemicals were three PAH (benzo(a)pyrene, naphthalene, and 1-methyl naphthalene), benzene, and methyl tertiary butyl ether (MTBE). The approach outlined a procedure to estimate the total loading of the pollutants into the water, based on the estimated hours of use. The approach then provided an estimate of how much water would be required to dilute the calculated emission loading to the level of the water quality standard or benchmark. The volume of water (referred to as the “threshold volume of water”) was then compared to the total available volume of water above the thermocline. A minimum pool of water and the respective surface areas for both Lakes Mead and Mohave were used to show a mixing depth that would be required to meet the threshold volume of water. As noted in the “Affected Environment” chapter, the thermocline occurs at a depth varying from 30 to 55 feet below the lake surface. The thermocline represents the bottom of the mixing zone. Above this layer, the entire column of lake water has a similar temperature and can mix freely.

The principal mechanisms that result in loss of the pollutant from the water also were considered. Many

organic pollutants that are initially dissolved in the water volatilize to the atmosphere, especially if they have high vapor pressures, are lighter than water, and mixing occurs at the air/water interface. Other compounds that have low vapor pressure, low solubility, and high octanol/water partition coefficients tend to adhere to organic material and clays and eventually adsorb onto sediments. By considering movements of the organics through the water column, an assessment can be made as to whether there could be an issue with standards or benchmarks being exceeded, even on a short-term basis. “Table 50: Toxicity Benchmarks,” shows the criteria and benchmarks used to assess impacts.

The California public health goal for MTBE listed in table 50 is a drinking water-based maximum contaminant level (MCL) and is not broadly applicable as the other criteria used in this analysis. The water intake that delivers drinking water to the Las Vegas Valley is located at a depth of 130 feet or more (depending on lake level) which is below the mixing zones in either Lake Mead or Lake Mohave. The threshold volume of water was calculated in acre-feet (1 acre-foot = 1 acre of water 1 foot deep). For example, if results showed that for benzo(a)pyrene, 55 acre-feet of water would be needed to dilute the expected emissions to below the benchmark level, and the receiving body of water is a 100-acre reservoir with an average depth of 20 feet (= 2,000 acre-feet) and is well-mixed, then this would

TABLE 50: TOXICITY BENCHMARKS

Water Quality Standard	Benzo(a)pyrene (µg/L)	Naphthalene (µg/L)	1-methyl naphthalene (µg/L)	Benzene (µg/L)	MTBE (µg/L) ²
Ecological Benchmark	0.014 (Suter and Tsao 1996)	62 (Suter and Tsao 1996)	34 ¹ (U.S. Fish and Wildlife Service 2000)	130 (Suter and Tsao 1996)	51,000 ² (Mancini et al. 200a)
Human Health Benchmark	0.0044 ³ (EPA 1999a) 0.049 ⁴	—	—	1.2 ³ (EPA 1999a) 71 ⁴	13 (California DHS 2002)
Arizona Standards for designated uses — Fish Consumption	0.0002 ³ (Arizona DEQ 1996)	—	—	—	—
<p>1. Based on LC₅₀s of 3,400 µg/L for sheepshead minnow (34 µg/L used for freshwater calculations).</p> <p>2. Ecological benchmarks, which are considered preliminary chronic water quality criteria, are 18,000 µg/L for marine and 51,000 µg/L for freshwater. There is no EPA human health benchmark, but California DHS (2002) has established a primary maximum contaminant level (MCL) of 13 µg/L.</p> <p>3. Based on the consumption of water and aquatic organisms. This is the more protective criteria and is used in the water quality evaluation.</p> <p>4. Based on the consumption of aquatic organisms only.</p>					

indicate little chance of an impact, especially when adding the effects of any other processes that contribute to the loss of benzo(a)pyrene from the water column. However, if the impact area is a 5-acre backwater averaging 2 feet deep (10 acre-feet), then there may be at least a short-term impact.

To assess impacts for all watercraft types, emissions of the watercraft listed in “Table 45: Annual Watercraft Population,” were used, based on estimates of relative emissions of unburned fuel and hours of use. Several studies have demonstrated that four-stroke engines are substantially cleaner than carbureted two-stroke engines, generating approximately 90% fewer emissions (NALMS 1999). The Oregon Department of Environmental Quality (ODEQ 1999) estimates emissions from four-stroke and direct-injection two-stroke engines to be from 75% to 95% cleaner. Emissions from all engine types were then added to personal watercraft emissions to yield a more complete estimation of loading to the receiving waterbody. A rate of one-tenth of the total emission attributed to carbureted two-stroke engines was used to represent the cleaner engine types.

Boating activity, and therefore pollutant loads, would be distributed over an entire day, from early morning to dusk. When released to water, benzene is subject to rapid volatilization, with a half-life for evaporation of about 5 hours (EPA 2001). Based on the time distribution of watercraft activity, a five-hour half-life was utilized in the calculations for benzene concentrations.

To understand the potential water quality effects of watercraft in specific areas of concern, park resource maps (graphical information system [GIS] maps) and experts were consulted to identify shallow water areas, areas containing submerged aquatic vegetation, critical aquatic and wildlife habitat, and the locations of drinking water intakes.

Given the above methodology and assumptions, the following impact thresholds were established to describe the relative changes in water quality (overall, localized, short-term, long-term, cumulative, adverse, and beneficial) under the various alternatives when compared with baseline (alternative D) conditions.

Negligible — Impacts (chemical, physical, or biological effects) are not detectable and are well below water quality standards and/or historical ambient or desired water quality conditions.

Minor — Impacts (chemical, physical, or biological effects) are detectable, but are well within or below water quality standards and/or historical ambient or desired water quality conditions.

Moderate — Impacts (chemical, physical, or biological effects) are detectable and are within or below water quality standards, but historical baseline or desired water quality conditions are being altered on a short-term basis.

Major — Impacts (chemical, physical, or biological effects) are detectable, and significantly and persistently alter historical baseline or desired water quality conditions. Water quality standards are locally approached, equaled, or slightly singularly exceeded on a short-term and temporary basis.

Impairment — Impacts (chemical, physical, or biological effects) that would be detectable and are substantially and frequently altered from the historical baseline or desired water quality conditions and/or water quality standards, or criteria that would be exceeded several times on a short-term and temporary basis. In addition, these adverse major impacts on park resources and values would contribute to the deterioration of the park’s water quality and aquatic resources to the extent that the park’s purpose could not be fulfilled as established in its enabling legislation, affect resources key to the park’s natural or cultural integrity or opportunities for enjoyment, or affect a resource whose conservation is identified as a goal in the park’s general management plan or other park planning documents.

The results of the surface water quality evaluation are discussed in the “impacts section” for each alternative and in appendix H.

Water Quality — Sensitive Aquatic Resources

Some research shows that PAH, including those from personal watercraft emissions, adversely affect water quality via harmful phototoxic effects on ecologically sensitive plankton and other small water organisms (EPA 1998; Oris et al. 1998; Landrum et al. 1987; Mekenyan et al. 1994; Arfsten et al. 1996). This could affect aquatic life and ultimately higher trophic levels in the food chain (e.g., fish). Of primary concern is the photic zone of the water column, which is the upper layer of water into which sunlight can penetrate.

While the overall water quality standards are being met at Lake Mead National Recreation Area, certain areas are more sensitive to potential effects of phototoxicity, due to their shallow depths and the potential presence of more vulnerable aquatic life. These areas include the sensitive inflow areas of Lake Mead, and because these areas are more sensitive, the impact assessment will focus on these regions of Lake Mead.

The following impact thresholds were established for these sensitive areas:

Negligible — Impacts are not detectable and would have no principal effect on aquatic resources and systems.

Minor — Impacts are considered detectable, but are not expected to have an overall effect on aquatic community structure.

Moderate — Impacts are clearly detectable and could have an appreciable effect on individual species dynamics, community ecology (e.g., the numbers of different kinds or diversity of aquatic life), or natural aquatic processes.

Major — Impacts have a substantial, highly noticeable influence on aquatic resources. This includes impacts that have a substantial effect on individual species, community ecology, or natural processes.

Impairment — Impacts result in the deterioration of water quality to the extent that the park's aquatic life and habitat no longer function as a natural system. [Water quality](#) impairment can affect other aspects of the natural environment dependent on the condition of this resource (e.g., waterfowl and migratory birds). Aquatic life are affected over the long-term to the point that the park's purpose (*Enabling Legislation, General Management Plan, Strategic Plan*) could not be fulfilled and the resource could not be experienced and enjoyed by future generations.

Vegetation Including Shoreline Vegetation

Laws, Regulations, and Policies. The NPS *Organic Act* directs the park to conserve the scenery and natural objects unimpaired for future generations. NPS *Management Policies* define the general principles for managing biological resources as maintaining all native plants and animals as part of

the natural ecosystem. When NPS management actions cause native vegetation to be removed, the National Park Service will seek to ensure that such removals will not cause unacceptable impacts on native resources, natural processes, or other park resources.

Exotic species, also referred to as nonnative or alien, are not a natural component of the ecosystem. They are managed, up to and including eradication, under the criteria specified in *Management Policies* and NPS-77 (NPS 1991).

Impact Indicators, Criteria, and Methodology.

The impacts on vegetation were evaluated in terms of the impacts on native vegetation and nonnative vegetation. Impacts on native vegetation occur primarily adjacent to the proposed expansion sites and along portions of Lake Mohave. While riparian ecosystems are considered essential components of the Southwest, on Lakes Mead and Mohave the riparian habitat has been irreversibly changed due to the impoundment of the river and the establishment of nonnative species.

The dominant shoreline vegetation below the high-water line around both Lakes Mead and Mohave is nonnative tamarisk. On Lake Mohave, flood-tolerant Gooding's willow (*Salix gooddingii*) is one of the primary native species present. This is due to the nature of Lakes Mead and Mohave. Native riparian ecosystems around the lakes are adversely affected by the dramatic water level fluctuations and increased soil salinization. Stands of vegetation that are able to establish in the drawdown zone are often inundated and flooded once water levels rise or are lost when water levels rapidly decline.

Riparian vegetation plays a critical role in the habitat within the recreation area at the inflow areas, including the Virgin and Muddy Rivers inflows, the Colorado River inflow at Pearce Ferry, and along portions of Lake Mohave where Gooding's willows have established. The Pearce Ferry area has been dramatically impacted by water fluctuations, but even with these fluctuations, once water levels decrease, the riparian habitat reestablishes. For these reasons, only these riparian areas will be evaluated in the impacts section.

In addition to the construction zones and riparian areas, there is potential rare plant habitat within the recreation area. While most of the habitat is above the high-water elevation, it is still accessible by foot

from the lakes. Therefore, potential impacts on rare plant habitat will be evaluated based on the accessibility by water-based recreationists.

The following were used to interpret the level of impacts on vegetation:

Negligible — Impacts have no measurable or perceptible changes in plant community size, integrity, or continuity.

Minor — Impacts are measurable or perceptible and localized within a relatively small area. The overall viability of the plant community would not be affected and, if left alone, would recover.

Moderate — Impacts cause a change in the plant community (e.g., abundance, distribution, quantity, or quality); however, the impact remains localized.

Major — Impacts on the plant community are substantial, highly noticeable, and permanent.

Impairment — The impact contributes substantially to the deterioration of the shoreline or shallow water environment to the extent that the park's shoreline or submerged vegetation no longer function as a natural system. These resources are affected over the long-term to the point that the park's purpose (*Enabling Legislation, General Management Plan, Strategic Plan*) cannot be fulfilled and the resource cannot be experienced and enjoyed by future generations.

When these criteria were not applicable, and in the absence of quantitative data, best professional judgment prevailed.

Wildlife and Wildlife Habitat

Laws, Regulations, and Policies. The NPS *Organic Act*, which directs parks to conserve wildlife unimpaired for future generations, is interpreted by the National Park Service to mean that native animal life should be protected and perpetuated as part of the recreation area's natural ecosystem. Natural processes are relied on to control populations of native species to the greatest extent possible. The restoration of native species is a high priority. Management goals for wildlife include maintaining the components and processes of naturally evolving park ecosystems, including natural abundance, diversity, and the ecological integrity of plants and animals.

The recreation area also manages and monitors wildlife cooperatively with the Arizona Game and Fish Department and the Nevada Division of Wildlife.

Impact Indicators, Criteria, and Methodology.

Information was gathered from literature and from park, state, and federal wildlife specialists to determine the "zones" where the use of motorized vessels, including personal watercraft, could potentially disrupt the natural behaviors of wildlife species. In addition, specific localized impacts were estimated based on knowledge garnered from similar past activities.

The park [interdisciplinary planning team](#) identified the primary zones where motorized vessels, including personal watercraft, could impact wildlife, including waterfowl. These zones are in the sensitive inflow areas of Lake Mead and along specific shoreline areas of Lake Mohave where native vegetation exists. Impacts on these zones by motorized vessels and personal watercraft were identified and assessed relative to the number of vessels and personal watercraft potentially traveling their proximity during critical seasons of use and by the type of species present in those sensitive areas.

The following categories were used by the National Park Service to interpret the level of impacts on wildlife:

Negligible — No species of concern is present; no impacts or temporary impacts are expected.

Minor — Nonbreeding animals of concern are present, but only in low numbers. Habitat is not critical for survival; other habitat is available nearby. Occasional flight responses by wildlife are expected, but without interference with feeding, reproduction, or other activities necessary for survival.

Moderate — Breeding animals of concern are present; animals are present during particularly vulnerable life stages, such as migration or winter; mortality or interference with activities necessary for survival are expected on an occasional basis, but not expected to threaten the continued existence of the species in the park.

Major — Breeding animals are present in relatively high numbers, or wildlife is present during particularly vulnerable life stages. Habitat targeted by actions has a history of use by wildlife during critical

periods, but there is suitable habitat for use nearby. Few incidents of mortality can occur, but the continued survival of the species is not at risk.

Impairment — The impact contributes substantially to the deterioration of natural resources to the extent that the park's wildlife and wildlife habitat can no longer function as a natural system. Wildlife and its habitat are affected over the long-term to the point that the park's purpose (*Enabling Legislation, General Management Plan, Strategic Plan*) cannot be fulfilled, and the resource cannot be experienced and enjoyed by future generations.

When these criteria were not applicable, standard definitions for the degree of change related to existing conditions were used. In the absence of quantitative data, best professional judgment prevailed.

Threatened and Endangered Species

Laws, Regulations, and Policies. Section 7 of the *Endangered Species Act* mandates all federal agencies to determine how to use their existing authorities to further the purposes of the act to aid in recovering listed species and to address existing and potential conservation issues. Section 7(a)(2) states that each federal agency shall, in consultation with the Secretary of the Interior, ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of designated critical habitat.

NPS Management Policies directs the parks to survey for, protect, and strive to recover all species [that are listed under the Endangered Species Act \(section 4.4.2.3\)](#) and [that are native to NPS units](#). It sets the direction to meet the obligations of the act. *Management Policies* also direct the National Park Service to inventory, monitor, and manage state and locally listed species and other native species that are of special management concern to the parks to maintain their natural distribution and abundance.

The *General Management Plan* designated 1,050,030 acres, or 70% of the national recreation area, as natural zones. Areas with known habitat or potential habitat for rare, threatened, or endangered species were further protected by placement in the environmental protection or the outstanding natural feature subzone of the natural zone. Management of

these zones focuses on maintaining isolation and natural process and restoring natural resources.

Impact Indicators, Criteria, and Methodology. The *Endangered Species Act* defines the terminology used to assess impacts on listed species as follows:

No effect — The appropriate conclusion when the action agency determines its proposed action would not affect a listed species or designated critical habitat.

Not likely to adversely affect — The appropriate conclusion when impacts on listed species are expected to be discountable, insignificant, or completely beneficial. Beneficial impacts are contemporaneous positive effects without any adverse effects on the species. Insignificant impacts relate to the size of the impact and should never reach the scale where take occurs. Discountable impacts are those extremely unlikely to occur. Based on best judgment, a person would not be able to meaningfully measure, detect, or evaluate insignificant effects or expect discountable effects to occur.

Likely to adversely affect — The appropriate finding if any adverse impact on listed species may occur as a direct or indirect result of the proposed action or its interrelated or interdependent actions, and the effect is not discountable, insignificant, or beneficial. In the event the overall impact of the proposed action is beneficial to the listed species, but is also likely to cause some adverse effects, then the proposed action is "likely to adversely affect" the listed species. If incidental take is anticipated to occur as a result of the proposed action, a "likely to adversely affect" determination should be made.

Likely to jeopardize proposed species / adversely modify proposed critical habitat (impairment) — The appropriate conclusion when the action agency or the U.S. Fish and Wildlife Service identify situations in which the proposed action is likely to jeopardize the continued existence of a proposed species or adversely modify the proposed critical habitat.

The impact analysis focuses on the potential for impacts on threatened and endangered species or their habitat from the proposed facility expansion at Callville Bay, Temple Bar, and Cottonwood Cove, from the recreational opportunity classifications and zoning on Lakes Mead and Mohave, and from the continued visitor use of the recreation area.

Cultural Resources

Laws, Regulations, and Policies. Numerous legislative acts, regulations, and NPS policies provide direction for the protection, preservation, and management of cultural resources on public lands. Further, these laws and policies establish what must be considered in general management planning and how cultural resources must be managed in future undertakings resulting from the approved plan regardless of the final alternative chosen. Applicable laws and regulations include the NPS *Organic Act*, the *Antiquities Act of 1906*, the *National Historic Preservation Act of 1966* (1992, as amended), the *National Environmental Policy Act of 1969*, the *National Parks and Recreation Act of 1978*, the *Archeological Resources Protection Act of 1979*, the *Native American Graves Protection and Repatriation Act of 1990*, and the Curation of Federally Owned and Administered Archeological Collections.

Applicable agency policies relevant to cultural resources include chapter 5 of NPS *Management Policies* (2001c), *Director's Order 28: Cultural Resource Management Guideline* (NPS 1998a), as well as other related policy directives such as the NPS *Museum Handbook* (NPS 2000d), the NPS *Manual for Museums* (Lewis 1976), and *Director's Order 6: Interpretation* (NPS 2001a).

The *Antiquities Act of 1906* authorized the president to establish historic landmarks and structures as monuments owned or controlled by the U.S. government and to institute a fine for unauthorized collection of their artifacts.

The NPS *Organic Act* established the National Park Service to manage the parks and monuments with the purpose of conserving historic objects within them and providing for their enjoyment.

The *National Historic Preservation Act of 1966* requires in section 106 that federal agencies with direct or indirect jurisdiction over undertakings take into account the effect of those undertakings on properties that are listed on, or eligible for listing on, the National Register of Historic Places. Section 110 of the act further requires federal land managers to establish programs in consultation with the state historic preservation office to identify, evaluate, and nominate properties to the national register. This act applies to all federal undertakings or projects requiring federal funds or permits.

The *National Environmental Policy Act of 1969* sets forth federal policy to preserve important historic, cultural, and natural aspects of our national heritage and accomplishes this by assisting federal managers in making sound decisions based on an objective understanding of the potential environmental consequences of proposed management alternatives. This act applies to any federal project or other project requiring federal funding or licensing. This act requires federal agencies to use a systematic, interdisciplinary approach integrating natural and social sciences to identify and objectively evaluate all reasonable alternatives to a preferred alternative.

The *National Parks and Recreation Act of 1978* requires that general management plans be developed for each unit in the national park system and that the plans include, among other things, measures for preserving the area's resources and an indication of the types and intensities of development associated with public use of a given unit.

The *Archeological Resources Protection Act of 1979* further codifies the federal government's efforts to protect and preserve archeological resources on public lands by stiffening criminal penalties, as well as instituting civil penalties, for the unauthorized collection of artifacts. Additionally, it establishes a permit system for the excavation and removal of artifacts from public lands, including their final disposition, as well as confidentiality provisions for sensitive site location information where the release of such information may endanger the resource.

The *Native American Graves Protection and Repatriation Act of 1990* sets forth procedures for determining the final disposition of any human remains, funerary objects, or objects of cultural patrimony that are discovered on public lands or during the course of a federal undertaking.

The Curation of Federally Owned and Administered Archeological Collections establishes guidelines and procedures for the proper curation and management of archeological collections owned or administered by federal agencies (36 CFR part 79).

Impact Indicators, Criteria, and Methodology. Impacts on cultural resources were developed based on existing conditions, current regulations, and likely development trends. The inventory of archeological resources in the park is largely incomplete. For purposes of assessing impacts, all unrecorded

resources are considered potentially eligible for listing on the National Register of Historic Places.

The park's inventory of standing structures and cultural landscapes is relatively complete; however, many structures and landscapes still require evaluation to determine their eligibility for listing on the National Register of Historic Places. For purposes of assessing potential impacts on these properties, unevaluated structures and landscapes are assumed to be potentially eligible.

Under section 106 of the *National Historic Preservation Act*, only historic resources that are eligible or are listed on the National Register of Historic Places are considered for impacts. An impact, or effect, on a property occurs if a proposed action would alter in any way the characteristic that qualifies it for inclusion on the National Register. If the proposed action would diminish the integrity of any of these characteristics, it is considered to be an adverse effect.

For the purposes of this document, the level of impacts on cultural resources was determined using the following criteria:

Negligible — No potentially eligible or listed properties are present; no direct or indirect impacts.

Minor — Potentially eligible or listed properties are present; no direct impacts or impacts with only temporary effects are expected.

Moderate — Potentially eligible or listed properties are present; indirect impacts or, in the case of structures, where activity is limited to rehabilitation conducted in a manner that preserves the historical and architectural value of the property.

Major — Potentially eligible or listed properties are present; direct impacts including physical destruction, damage, or alteration of all or part of a property. Isolation of a property from its setting or alteration of the character of a property's setting when that character contributes to its eligibility, including removal from its historic location. Introduction of visual, audible, or atmospheric elements that are out of character with the property, or alteration of its setting. Neglect of a property resulting in its deterioration or destruction (36 CFR 800.5).

Impairment — Loss, destruction, or degradation of a cultural property, resource, or value to the point that it negatively affects the park's purpose and visitor experience.

In the absence of quantitative data concerning the full extent of actions under a proposed alternative, best professional judgment prevailed.

Visitor Use, Experience, and Safety

Laws, Regulations, and Policies. Visitor use in parks is authorized in the NPS *Organic Act* and managed under the NPS *Management Policies* in the "Use of Parks" section, which includes commercial as well as public use. The policies state that enjoyment of park resources and values by the people of the United States is part of the fundamental purpose of all parks, and that the National Park Service is committed to providing appropriate, high-quality opportunities for visitors to enjoy the parks. Further, the National Park Service will strive to protect human life and provide for injury-free visits and will seek to provide a safe and healthful environment for visitors and employees.

Because many forms of recreation do not require a national park setting, the National Park Service will

provide opportunities for forms of enjoyment that are uniquely suited and appropriate to the superlative natural and cultural resources found in the parks

defer to local, state, and other federal agencies, private industry, and nongovernmental organizations to meet the broader spectrum of recreational needs and demands

Unless mandated by statute, the National Park Service will not allow visitors to conduct activities that

would impair park resources or values

create an unsafe or unhealthful environment for other visitors or employees

are contrary to the purposes for which the park was established

unreasonably interfere with the atmosphere of peace and tranquility or the natural soundscape

maintained in the wilderness and natural, historic, or commemorative locations within the park; with NPS interpretive, visitor service, administrative, or other activities; with NPS concessioner or contractor operations or services; or with other existing, appropriate park uses

Recreational purposes and activities authorized at Lake Mead National Recreation Area are more specifically defined in section 4 of the area's enabling legislation (PL 88-639). The *General Management Plan* (NPS 1986) defined the recreational setting for all shoreline recreation facilities. The plan further defines the water-based carrying capacities by setting capacity limits for launch ramps and marinas. These capacities are listed in "Appendix B: Analysis of Recreational Carrying Capacity." In this *Lake Management Plan*, the park is zoned for recreational settings, and development capacities to maintain the recreational settings are identified. The *Strategic Plan* for Lake Mead National Recreation Area sets standards for the management of recreational facilities.

The *Government Performance and Results Act* requires the park to report on visitor satisfaction each year. Based on visitor use surveys, the park has identified key indicators for visitor satisfaction and boater safety. One key safety indicator for boating is boating density, which is measured in acres of water per boat. Park studies and accident reports correlate the majority of boating accidents occurring in the area with the highest density of boats. Other factors such as shoreline spacing and crowding at selected sites are used to monitor visitor satisfaction. Visitor surveys have been completed for Lakes Mead and Mohave by various authors in 1993–94, 1997, 1998, 1999, and 2000.

Visitor satisfaction is an important indicator for the quality of the visitor experience. Each June, the National Park Service conducts a visitor survey of approximately 400 park visitors at a variety of recreational facilities, as directed under the *Government Performance and Results Act*. The standard for Lake Mead is 80% of park visitors being satisfied overall with facilities, services, and recreational opportunities. In 1999 visitor satisfaction was measured at 86%.

Impacts on visitor use that are monitored by the National Park Service include visitor satisfaction, boating accidents, traffic circulation, waiting time to launch, launch ramp parking lot capacity, empty slips

in the marinas, boat distribution, quality of recreational facilities, and exposure of the visitor to flood hazards. The National Park Service employed Dr. Alan Graefe of Pennsylvania State University to evaluate the impacts on visitor use and assist in putting the impacts into a national perspective. In the absence of specific data, the park used the professional judgment of park staff and other knowledgeable individuals to assess impacts.

As described in the "Affected Environment" chapter, Arizona and Nevada watercraft regulations, including personal watercraft regulations, are in place and are enforced within the park. These regulations govern the type of personal watercraft activities near the shore, the timing of personal watercraft use, and the age and educational requirements of personal watercraft operators.

Impact Indicators and Criteria. Impacts on visitor use, experience, and safety were based on the following criteria:

Negligible — No impacts on the visitor experience or only temporary effects are expected. Little noticeable change in visitor experience (or in the defined indicators of visitor satisfaction) or behavior. The impact on visitor safety is not measurable or perceptible.

Minor — Desired visitor experience is changed, but without appreciably limiting or enhancing critical characteristics of the experience. Visitor satisfaction remains stable. Impacts on visitor safety may be realized through a minor increase or decrease in the potential for visitor conflicts in current accident areas. The following conditions are considered minor impacts:

Visitor satisfaction — 20% of the lake users are not satisfied with their experience.

Crowding — Visitors wait in launch lines that are less than 30 minutes during the summer months.

Displacement — Visitors must travel a few hundred feet to find desired recreational setting.

Safety — Visitors may observe a boating safety violation.

Conflict — Visitors must consider conflict in choosing their parking or beach site.

Moderate — Critical characteristics of the desired experience are changed or the number of participants engaging in an activity is altered. Visitor satisfaction begins to decline. The impact on visitor safety is sufficient to cause a permanent change in accident rates at existing low accident locations or create the potential for additional visitor conflicts in areas that currently do not exhibit noticeable visitor conflict trends. Conditions describing moderate impacts include:

Visitor satisfaction — 20% to 50% of the lake users are not satisfied with their experience.

Crowding — Visitors wait in launch lines that exceed 30 minutes and spends 15 minutes looking for a parking place.

Displacement — Boaters have to travel over 30 minutes to seek desired recreational setting.

Safety — Visitors observe numerous safety violations.

Conflict — Visitors observe conflict at the shoreline and on the water.

Major — Impacts eliminate, detract from, or greatly enhance multiple critical characteristics of the desired experience or greatly reduce or increase participation. Visitor satisfaction declines substantially. The impact on visitor safety is substantial either through the elimination of potential hazards or the creation of new areas with a high potential for serious accidents or hazards. The following conditions are considered major impacts:

Visitor satisfaction — Over 50% of lake users are not satisfied with their experience.

Crowding — Visitors wait in launch lines that exceed 1.5 hours; there are so many boats on the water, visitors cannot participate in their desired water activity; parking is at capacity and visitors must park along the access road shoulder.

Displacement — Boaters cannot find desired recreational setting within 1 hour of launching.

Safety — Visitors are nearly involved or are involved in an accident (accident rate exceeds the average of 176 reported accidents per year).

Conflict — Visitors are involved in some form of conflict with other park users.

Soundscapes

Laws, Regulations, and Policies. The NPS *Management Policies* (Section 4.9) requires the managing agency to preserve, to the greatest extent possible, the natural soundscapes of the park. Natural soundscapes exist in the absence of human-caused sound. The natural soundscape is the aggregate of all the natural sounds that occur in parks, together with the physical capacity for transmitting natural sounds. NPS *Management Policies* directs superintendents to identify what levels of human-caused sound can be accepted within the management purposes of the parks.

Director's Order 47: Soundscape Preservation and Noise Management (NPS 2000b) defines appropriate and inappropriate noise. The overall goal of NPS units, as defined in the order, is the protection, maintenance, or restoration of the natural soundscape resource. However, it does state that some sound-producing activities, including recreational activities, may be appropriate if they are included in the park's purpose as defined by its enabling legislation.

The enabling legislation for Lake Mead National Recreation Area states it "shall be administered by the Secretary of the Interior for general purposes of public recreation, benefit and use, and in a manner that will preserve, develop, and enhance, so far as practicable, the recreation potential, and in a manner that will preserve the scenic, historic, scientific, and other important features of the area." The 1964 legislation further defines recreational activities that may be permitted to include bathing, boating, camping, and picnicking.

The specific reference to boating has been interpreted to include most recreational boats and specifically motorized boats. Therefore, impact on soundscapes was anticipated and does occur as part of motorized boating on lake waters.

Noise abatement is regulated by the National Park Service within Lake Mead National Recreation Area and other units of the national park system (36 CFR). "Operating a vessel in or upon inland waters so as to exceed a noise level of 82 decibels measured at a distance of 82 feet (25 meters) from the vessel is prohibited." These standards are difficult to enforce

because they require estimating distances in addition to monitoring sound.

Boating noise is also regulated by the states of Nevada and Arizona. The respective states have developed standards relative to boat noise, and these standards are enforced by both state and federal law enforcement officers on Lakes Mead and Mohave. Nevada has promulgated a new rule that includes a noise standard at any location in addition to the standards at specific distances. [This standard is 75 A-weighted decibels measured at the shoreline, independent of speed or distance](#), for all motorized vessels (Nevada Administrative Code Section 488.460). [The Nevada 75-decibel limit must be measured in accordance with the Society of Automotive Engineers \(SAE\) standard SAE J1970, Shoreline Sound Level Measurement Procedure.](#) Unaltered pre-1998 personal watercraft technology and current personal watercraft technology will generally meet this standard.

Impact Indicators, Criteria, and Methodology.

The methodology used to assess noise impacts from personal watercraft in this document is consistent with the methodology being developed for NPS Reference Manual 47, "Soundscape Preservation and Noise Management," in accordance with 2001 NPS *Management Policies* and NPS *Director's Order 47*. Context, time, and intensity interact in a complex manner that determines the level of noise impact for an activity. For example, a certain amount of time and intensity would be a greater impact in a highly sensitive context, and a given intensity would be a greater impact if it occurred more often or for a longer duration. It is usually necessary to evaluate all three factors together to determine the level of noise impact. In some cases, analysis of one or more factors may indicate one impact level, while analysis of another factor indicates a different impact level according to the criteria below. In such cases, management judgment based upon a documented rationale must be used to determine which impact level best applies to the situation being evaluated.

Sound levels generated by motorized vessels, including personal watercraft, are expected to affect recreational users differently depending upon their activities and interests. For example, visitors participating in less sound-intrusive activities, such as kayaking, would likely be more adversely affected by watercraft noise than other users of personal watercraft or motorboats. Therefore, impacts on soundscapes must also take into account the effect of

noise on different types of recreational users within the study area.

Park-specific factors related to context, time, and intensity are discussed below and then integrated into a discussion of the impact thresholds used in this analysis.

Context — The recreation area includes the lake surface, which is characterized by intense motorized boating activity, including personal watercraft use, between May and September and light to moderate use during the remainder of the year.

Existing background noise levels at Lake Mead National Recreation Area are influenced by boats, automobile and truck traffic, and airplanes. While specific background noise studies are not available for Lake Mead National Recreation Area, given its setting, it is assumed that the soundscape ranges from active urban in the developed areas and high-use zones on the lakes to quiet rural in the outlying areas of the lake where use levels are considerably lower.

The recreation area resources most likely to be affected by motorized vessel noise, including personal watercraft noise, include the park's natural soundscape, cultural properties (such as sacred sites), and noise-sensitive wildlife.

Visitor experiences most likely to be affected by motorized vessel and personal watercraft noise include the opportunities to experience solitude and the park's natural soundscape unaffected by human noise. People in parties associated with personal watercraft use may not be adversely affected, while people not associated with personal watercraft use, even if they are associated with other types of motorized boat activity, may consider personal watercraft use intrusive. For those who use boats primarily as a means of transport, and then moor their boat to enjoy the destination site in relative isolation, personal watercraft use by another party may adversely affect their visitor experience.

On a typical summer weekend there are approximately 4,000 boats operating at any one time on the waters of Lakes Mead and Mohave. At peak use, this number exceeds 5,000 boats. During these times, the sound of boats can be continuous in the urban park and urban natural zones. Boat noise can be heard in the rural natural zones during periods of high boating activity, but there are extended periods when boat noise cannot be heard. Currently, there are

no areas where motorized boating is prohibited, so there are no existing areas on the lakes where visitors can go to escape boating-related sounds.

Noise can be characterized by the type of boat. There are a number of large boats that are powered by multiple inboard or outboard engines and are capable of operating at high speeds. When operating at high speeds, the sound is noticeable to the point that it disrupts normal conversation some distance from the boats, but these periods are generally of limited duration. These boats have the option of running the exhaust through the transom or through the water. When the exhaust is run through the transom, there is no muffler system and the noise produced can exceed 100 decibels. These boats will be prohibited from operating in the recreation area if operators choose to run the exhaust through the transom. Noise from these vessels currently results in complaints from the shoreline visitors and other boaters.

All motorized watercraft, including personal watercraft, produce noise that may impact park soundscapes and visitor experiences. Noise levels vary by lake and area, with the most intense noise from motorized vessels occurring in the urban park and urban natural zones and less noise occurring in the more isolated portions of the lakes, including the sensitive inflow areas and those areas zoned as primitive and semiprimitive.

Komanoff and Shaw (2000) note that the biggest difference between noise from personal watercraft and that from motorboats is that the former continually leave the water, which magnifies noise in two ways. Without the muffling effect of water, the engine noise is typically 15 A-weighted decibels louder, and the smacking of the craft against the water surface results in a loud “whoop” or series of them. With the rapid maneuvering and frequent speed changes, the impeller has no constant “throughput” and no consistent load on the engine. Consequently, the engine speed rises and falls, resulting in a variable pitch. This constantly changing sound is often perceived as more disturbing than the constant sound from motorboats.

Most studies on the effects of noise on soundscapes and human receptors have focused on highway and airport noise. Komanoff and Shaw (2000) used the analytical approaches of these studies to perform a noise-cost analysis of personal watercraft. They concluded that the cost to beachgoers from personal watercraft noise was more than \$900 million per

year. The cost per personal watercraft was estimated to be about \$700 per vessel each year or \$47 for each 3-hour “personal watercraft day.” They concluded that the cost per beachgoer was the highest at secluded lake sites, where beachgoers had a higher expectation of experiencing natural quiet and usually invested a larger amount of time and personal energy in reaching the area. However, because there are many more visitors to be affected at popular beaches, noise costs per personal watercraft were highest at crowded sites (*Drowning in Noise: Noise Costs of Jet Skis in America* [Komanoff and Shaw 2000]).

Manufacturers of personal watercraft are aware of public concerns related to the noise of personal watercraft operation. Steps are currently being taken to reduce the noise by using more rubber in construction to eliminate vibrations. The newer four-stroke engines are quieter. Some have been measured to emit approximately 72 decibels per unit at 100 feet (PWIA 2001).

Motorized vessel use, including personal watercraft, occurs on virtually the entire lake surface, although there are coves and other areas of particularly high use. There are also coves and other areas of particularly low use. In contrast to other motorized vessels, personal watercraft are often towed by a houseboat to a staging area, and they tend to stay relatively close to the staging area. It is very difficult to identify routes for motorized vessels, including personal watercraft; it is much more accurate to identify areas of concentrated use.

Time factors — Motorized vessel use, including personal watercraft, can occur year-round, but use decreases during the winter months. Personal watercraft are only permitted to operate during daylight hours.

Time periods of greater sensitivity to noise impacts include sunset, sunrise, and nighttime when boaters are in camp and when wildlife may be more active, such as coming to the lake for water.

In areas and times of concentrated motorized vessel use, noise from motorized vessels, including personal watercraft, can be present virtually constantly from near sunrise to near sunset. In areas of low use, noise can be intermittent, usually lasting at least a few minutes when a vessel is present.

Intensity — Existing natural ambient sound levels within the project area are expected to range from

roughly 20 to 40 A-weighted decibels, which is low and comparable to acoustic data collected at Grand Canyon National Park, Glen Canyon National Recreation Area, Bryce Canyon National Park, and Zion National Park in areas with similar vegetation type, height, and density characterized mostly by wind in the vegetation and wildlife (especially insects and birds). The primary human factor affecting the natural soundscape is motorized watercraft, beach activities (including generators and music), aircraft, and automobile and truck traffic. Given this, the primary soundscape issue at Lake Mead National Recreation Area is the effect of the noise generated by these sources as it affects the natural soundscape and as is perceived by visitors who use the national recreation area for natural sounds, quiet, or solitude.

Noise levels emitted from motorized vessels, including personal watercraft, vary from vessel to vessel depending upon many factors. There is no definitive literature describing scientific measurements of personal watercraft noise. Some personal watercraft industry literature states that all recently manufactured watercraft emit fewer than 80 decibels at 50 feet from the vessel, whereas other literature attributes levels as high as 102 decibels without specifying distance. None of this literature adequately describes the methodology for collecting the data to determine those levels. Because of this, the National Park Service contracted noise measurements of motorized vessels, including personal watercraft, in 2001 at Glen Canyon National Recreation Area (NPS n.d.). The noise source data from this study was used in this environmental impact statement soundscape analysis because the Glen Canyon results were not dependent upon or influenced by park geology or other environmental factors. At Glen Canyon, sound measurements were made of a number of boats and personal watercraft as they passed by a microphone mounted above the front of an instrumented boat. Controlled pass-by measurements of three personal watercraft and one motorboat were conducted at several different speeds. Many boats and personal watercraft were also randomly measured. In all cases, a radar gun was used to determine speed and a laser range finder was used for distance. After normalizing measurements to a common distance, maximum sound levels were computed both for 15 meters and for 25 meters, the distance at which NPS watercraft noise emission regulations apply. Analysis of this data indicates maximum noise levels for personal watercraft at 82 feet ranged from approximately 67 to 76 A-weighted decibels. Maximum levels at 82 feet for other motorboat types were measured during that study and

ranged from approximately 65 to 86 A-weighted decibels.

Literature from groups opposing personal watercraft state that personal watercraft may be more noticeable and, therefore, more of an impact on people than other motorized vessels because of rapid changes in acceleration and direction and jumping into the air, causing rapid increases in the noise level and changes in sound frequency distribution.

Integrating context, time, and intensity. To estimate the relative impacts of personal watercraft use at the park, the following methodology was followed:

1. The Lake Mead National Recreation Area visitor use survey (Graefe and Holland 1997) and the Nevada Division of Wildlife study (State of Nevada 1999a) were used to estimate the number of personal watercraft relative to other watercraft.
2. Results from the August 2001 Glen Canyon study were compared with other information and national literature to determine the time factors and intensity levels that best represent the sound produced by the personal watercraft and other watercraft in the situation being evaluated.
3. Context sensitivity was determined through an analysis of park purpose, significance, management objectives and zoning, park resources and values, and specific sites. Areas of shoreline use by other visitors were identified in relation to where personal watercraft launch and play offshore. Personal observation by park staff was used to identify these areas, as well as the estimates of the numbers of personal watercraft and the timeframes of use (morning, afternoon, evening).
4. Other considerations, such as topography, vegetation, prevailing winds, and other noise sources were used to identify areas where personal watercraft noise levels may be exacerbated or reduced.

After estimating the number of personal watercraft, the range of relative noise generated by them, and the potential areas where noise concentrations and effects on other visitors may be of concern, the following thresholds were used as indicators of the magnitude

of impact for each of the management alternatives. The criteria will be applied on a site-specific as well as on a parkwide basis to assess the level of impact.

Negligible — In the more developed areas (the high-use areas, including the rural natural, urban natural, and urban park zones), human-caused noise associated with approved activities may be present up to 80% of the time during daylight hours, but for at least 90% of the time noise is present, it is at low levels compared to the natural soundscape. Human-caused noise is no more than rarely audible between sunset and sunrise at 500 feet or more from the noise source.

In the less-developed areas (those areas designated as sensitive for resource protection, such as sensitive inflow areas and primitive and semiprimitive zones), natural sounds are predominant. Human-caused noise is rarely audible at 100 feet or more from the noise source, and it is audible at all only in small portions of the less-developed zones adjacent to the more-developed zones. If human-caused noise is present at all, it is only at very low levels compared with the natural soundscape and only for short durations in most of the area. Visitors almost always have the opportunity to experience the natural soundscape free from human-caused noise, especially between sunset and sunrise.

Minor — In the more-developed areas, human-caused noise associated with approved activities may predominate during daylight hours, but for at least 50% of the time noise is present, it is at low levels compared with the natural soundscape and is only rarely at greater than moderate levels. Human-caused noise is no more than occasionally audible between sunset and sunrise at 500 feet or more from the noise source.

In the less-developed areas, natural sounds are usually predominant. Human-caused noise is present only infrequently, at low levels compared with the natural soundscape and only for short durations in most of the area. Only small portions of the less-developed areas adjacent to the more-developed areas are affected more than infrequently. Visitors have the opportunity to experience the natural soundscape free from human-caused noise most of the time in most of the area. Human-caused noise is no more than rarely audible between sunset and sunrise at 100 feet or more from the noise source.

Moderate — In the more-developed areas, human-caused noise associated with approved activities predominates during daylight hours, but is at moderate or lower levels compared with the natural soundscape a majority of the time that noise is present. Localized areas may experience human-caused noise at moderate to high levels compared with the natural soundscape for a majority of each hour during half of the daylight hours. Human-caused noise is occasionally audible between sunset and sunrise at 500 feet from the noise source.

In the less-developed areas, natural sound predominates the majority of the time in the majority of the area. Human-caused noise is present infrequently to occasionally, at no more than moderate levels compared with the natural soundscape and for no more than moderate durations. Small portions of the less-developed areas adjacent to the more-developed areas may be often affected by human-caused noise. Visitors have the opportunity to experience the natural soundscape free from human-caused noise the majority of the time in the majority of the area. Human-caused noise is no more than occasionally audible between sunset and sunrise at 100 feet or more from the noise source.

Major — In the more-developed areas, human-caused noise associated with approved activities predominates during daylight hours and is at greater than moderate levels compared with the natural soundscape a majority of the time that noise is present. Large areas may experience human-caused noise at moderate to high levels compared with the natural soundscape for a majority of each hour during a majority of the daylight hours. Human-caused noise is more than occasionally audible between sunset and sunrise at 500 feet from the noise source.

In the less-developed areas, natural sounds are masked by human-caused noise frequently or for extended periods of time, often at moderate or higher levels compared with the natural soundscape and/or in a majority of the area. More than small portions of the less-developed areas adjacent to the more-developed areas may experience moderate or greater impacts from human-caused noise. Visitors have the opportunity to experience the natural soundscape free from human-caused noise less than a majority of the time in the majority of the area. Human-caused noise is more than occasionally audible between sunset and sunrise at 100 feet from the noise source.

Impairment — In the more-developed areas, natural sounds are impacted by human noise frequently or for extended periods of time at greater than moderate levels in the majority of the area. Human-caused noise is frequently audible between sunset and sunrise at 500 feet from the noise source. The purpose and mission of the area in the park cannot be fulfilled.

In the less-developed areas, the natural soundscape is impacted at greater than moderate levels the majority of the day or frequently at night. The purpose and mission of the area in the park cannot be fulfilled.

Socioeconomic Resources

Laws, Regulations, and Policies. In accordance with NPS *Management Policies* (Section 8.2.2.2), the park may permit commercial visitor services that are necessary and appropriate for public use and enjoyment of the park and are consistent to the highest practicable degree with the preservation and conservation of the park's resources and values. The Lake Mead National Recreation Area *Commercial Services Plan* (appendix A) was prepared in 2000 to develop a strategy to meet visitor needs while maintaining the purposes and values of the park. The plan defines the range of visitor services that meets the "necessary and appropriate" criteria. This commercial services plan is being published for the first time in this document and is included in appendix A.

Impact Indicators, Criteria, and Methodology. The impacts on socioeconomic resources, including the commercial operations within the park, in adjacent communities, and in the region, were considered. Concessions specialists and members of the business community were consulted to assess potential impacts of each alternative. However, without substantial research, it is difficult to establish definitive figures and costs associated with each impact topic. Therefore, a more general discussion of the impacts on socioeconomic resources is included in the consequences section.

Park Operations

Laws, Regulations, and Policies. The *Lake Mead National Recreation Area Strategic Plan* (NPS 1998b) and the *Lake Mead National Recreation Area Business Plan* (NPS 1999a) evaluated aspects of

Lake Mead National Recreation Area related to budgetary and staffing needs. This plan showed the park's infrastructure was deteriorating from overuse, excessive age, and inadequate design. In addition, inflation, the increased cost of doing business, adjacent urbanization, and increased visitation were factors affecting operations. Staffing and budget shortfalls were evaluated, and it was determined that in 1998 there was a staffing shortfall of 207 full-time employees (1 full-time employee equals 1 person working for 1 year), while the budget shortfall was \$8.8 million. The most significant budget deficiencies were in areas of visitor's experience (\$3.7 million) and facility operations (\$2.8 million). Maintenance staff was so shorthanded it could only meet 48% of the defined minimal acceptable standards.

Law enforcement operations were evaluated by the Department of the Interior in 1998 to determine if the park was meeting the minimal standards for law enforcement. Although the Department of the Interior found an extremely professional program, they also found that Lake Mead National Recreation Area was severely understaffed and needed 34 (at that time) more full-time rangers to meet the minimal acceptable standards.

The Lake Mead National Recreation Area maintenance program was evaluated in 1999 and 2000 by park staff, and staffing deficiencies were analyzed at that time (NPS 2000c).

The resource management program was evaluated in 1992, with revisions in 1995, under the Resource Management Assessment Program and the Cultural Resource Management Assessment Program to assess the staffing deficiencies and future needs for these programs (NPS 1992).

Impact Indicators, Criteria, and Methodology. Impacts on park operations were evaluated based on the above reports and on interviews with park personnel specialists, division chiefs, and program managers. Evaluations were based on the number of positions reported deficient within each program area.

CUMULATIVE IMPACTS

Cumulative impacts were analyzed for the alternatives and the preferred alternative. Cumulative impacts are the incremental impacts on the

environment resulting from adding the actions proposed under each alternative to other past, present, and reasonably foreseeable future actions. This includes potential actions within and outside the recreation area boundary.

Specific projects with the potential to cumulatively affect the resources (impact topics) include area development and growth, recreational development adjacent to the recreation area, transportation issues, water quality improvement projects, and threatened and endangered species protection initiatives and programs.

The populations of Las Vegas, Laughlin, and Bullhead City have grown exponentially in the past 10 years. In addition, population centers in Los Angeles, Phoenix, and Salt Lake City have led the nation in growth over recent years. This growth has influenced Lake Mead National Recreation Area in many ways, including increased visitation, pressure and development along the recreation boundaries, urban runoff and inflow from the Las Vegas Valley, and increased air pollution.

The communities of Boulder City, Henderson, Las Vegas, Bullhead City, and Laughlin are developing up to recreation area boundaries. Housing developments and golf courses have been constructed adjacent to the recreation area boundary. There is the potential for future development along park boundaries, and it is anticipated that this trend will continue to increase.

The runoff from the Las Vegas Valley flows into Lake Mead in the Las Vegas Wash. In addition, Las Vegas Wash is the outflow for the treated wastewater for the Las Vegas Valley. Lake Mead National Recreation Area is working with the Las Vegas Wash Coordination Committee and the Las Vegas Water

Quality forum to improve and study the water quality of Lake Mead. An alternative discharge study has been initiated to develop alternatives to protect the water quality of the Las Vegas Wash and Lakes Mead and Mohave.

The Clark County *Multiple Species Habitat Conservation Plan* (Clark County 2000a) was completed in 2000 and identified protection strategies for sensitive, threatened, and endangered plant and animals species in southern Nevada. This provided the park with support for the active preservation of these species and their habitat or potential habitat. The Native Fish Work Group is working to preserve endemic fish species and their habitat within Lakes Mead and Mohave. In addition, the Colorado River *Multiple Species Habitat Conservation Plan* is currently in draft form and will supply additional support for the protection of sensitive, threatened, and endangered species along the Colorado River corridor.

All forms of transportation have increased dramatically over the last 10 years and are expected to increase in the future. All regional roads are operating at or near capacity, and major upgrades are underway for U.S. Highway 93, U.S. Highway 95, and Interstate 15. In addition, commercial air tours over Lake Mead National Recreation Area average 800 flights per day.

This information was considered when developing the cumulative impacts of each alternative. However, some of this information may be inexact at this time. Major sources of impacts have been assessed as accurately and completely as possible. More detailed analyses would be completed with individual project site plans.

IMPACTS OF ALTERNATIVE A: NO ACTION

This no-action alternative is based on implementing the *General Management Plan* that was approved in 1986. Specific actions authorized under the *General Management Plan* include expanding the marinas at Cottonwood Cove, Callville Bay, and Temple Bar, and formalizing shoreline camping at Government Wash. The development of a new facility at the Fire Mountain Site on the Nevada side of Lake Mohave, while authorized in the *General Management Plan*, has been removed from this alternative because the remote location and costs associated with development at this site make it infeasible and because of issues related to carrying capacity and preserving the desert tortoise and its habitat.

In addition, under this no-action alternative, no rule would be developed to allow for the continued use of personal watercraft in the recreation area. Impacts resulting from the complete elimination of personal watercraft from the recreation area are addressed in this discussion.

The impacts of the actions and management prescriptions under the *General Management Plan* are addressed in that plan and are summarized here.

AIR QUALITY

Use of personal watercraft would be prohibited in the park. Initially, a decline in visitor use would occur; however, it was assumed that personal watercraft users would return over the subsequent years using other watercraft. Total use of the lakes by watercraft within several years would be the same as if personal watercraft had not been prohibited. The types of boats that would use the lake instead of personal watercraft would be in the same proportions as found in the most recent lake surveys. Carbureted two-stroke outboard engines would be converted over time to the cleaner marine engines with the implementation of the EPA 2006 regulation.

Human Health Impacts from Airborne Pollutants Related to Watercraft Use

Watercraft emissions of health-related pollutants were calculated for the years 2004 and 2012 according to the methods and assumptions described earlier in this chapter. Estimated emissions for

alternative A are presented in “Table 51: Comparison of Estimated Emissions for All Alternatives.” The pollutant emissions calculated for 2004 and 2012 are also shown graphically in “Figure 16: Pollutant Emissions for 2004 and 2012 — All Watercraft” and “Figure 17: Annual Emissions for HC + NO_x — All Watercraft.”

The Lake Mead National Recreation Area is an attainment area because the ambient air quality levels in the analysis area are within the national ambient air quality standards. Existing emissions are similar to those shown for alternative D in 2004 (see table 51). The Lake Mead National Recreation Area would continue to be in attainment under alternative A, as described below. No change in class II airshed status would result from this alternative, because personal watercraft and other watercraft activities would not result in the violation of any national ambient air quality standard.

Under alternative A, hydrocarbon (HC) emissions would be 369 tons in 2004 and 320 tons in 2012, compared with alternative D (918 in 2004 and 659 tons in 2012). Under alternative A, elimination of personal watercraft along with replacement of other marine engines would result in HC emission reductions of 549 tons per year in 2004 and 339 tons per year in 2012, compared to alternative D (baseline).

An increase in NO_x emissions would occur under alternative A because NO_x emissions of other watercraft are greater than those of most personal watercraft. As described in the “Methodology” section under “Applicable Emission Standards” in this chapter, the sum of HC+NO_x emissions is the standard of the EPA rule. Both HC and NO_x are ozone precursors in the presence of sunlight. As shown in table 51, under alternative A, there would be a net reduction in HC+NO_x emissions of 480 tons per year in 2004 and 279 tons per year in 2012, when compared to alternative D (baseline), and a potential beneficial effect on regional ozone levels. The impact on human health from HC and NO_x would be minor in the long-term. This conclusion was based on the modeling results, the current ozone measurements, which are within the national standard, and the anticipated beneficial effect on regional ozone levels.

TABLE 51: COMPARISON OF ESTIMATED EMISSIONS (IN TONS PER YEAR) FOR ALL ALTERNATIVES

	Alternative A¹				Alternative B²				Alternative C³				Alternative D⁴			
	2004		2012		2004		2012		2004		2012		2004		2012	
Percent of carbureted two-stroke engines replaced	21.6%	100%	58.4%	100%	100%		100%		21.6%		100%		21.6%		58.4%	
	Water-craft	PWC	Water-craft	PWC	Water-craft	PWC	Water-craft	PWC	Water-craft	PWC	Water-craft	PWC	Water-craft	PWC	Water-craft	PWC
Pollutant																
Hydrocarbons	369	0	320	0	346	189	346	189	904	689	360	199	918	701	659	467
Nitrogen oxides	230	0	234	0	181	38	181	38	159	16	186	40	161	16	174	28
HC+NO _x	599	0	544	0	527	227	527	227	1,063	705	546	239	1,079	717	833	495
Carbon monoxide	5,867	0	5,923	0	5,423	1,837	5,423	1,837	5,506	1,898	5,608	1,936	5,589	1,929	5,638	1,947
Particulate matter 10 microns or less	16	0	15	0	40	33	40	33	49	40	42	35	50	41	47	38
Particulate matter 2.5 microns or less	15	0	14	0	37	30	37	30	45	37	39	32	46	38	43	35
<p>Notes:</p> <p>Ambient Air Quality: For each alternative in all years, concentrations of CO, NO_x, O₃, PM₁₀, and PM_{2.5} would not exceed national standards. For each alternative, SUM06 is 16 to 32 parts per million-hour.</p> <p>1. Alternative A (No Action): Personal watercraft use would be prohibited. Carbureted two-stroke engines would convert to four-stroke engines or two-stroke, direct-injection engines at the rate projected by the Environmental Protection Agency.</p> <p>2. Alternative B: All carbureted two-stroke engines would be banned.</p> <p>3. Alternative C (Modified Preferred Alternative): After 2012, all boats on the lakes would be compliant with the EPA 2006 emission standards.</p> <p>4. Alternative D (Baseline Alternative): By 2012, 58.4% of carbureted two-stroke engines on the lakes would be converted to meet the EPA 2006 emission standards. EPA predicts that by 2030, 75% of engines would be converted.</p>																

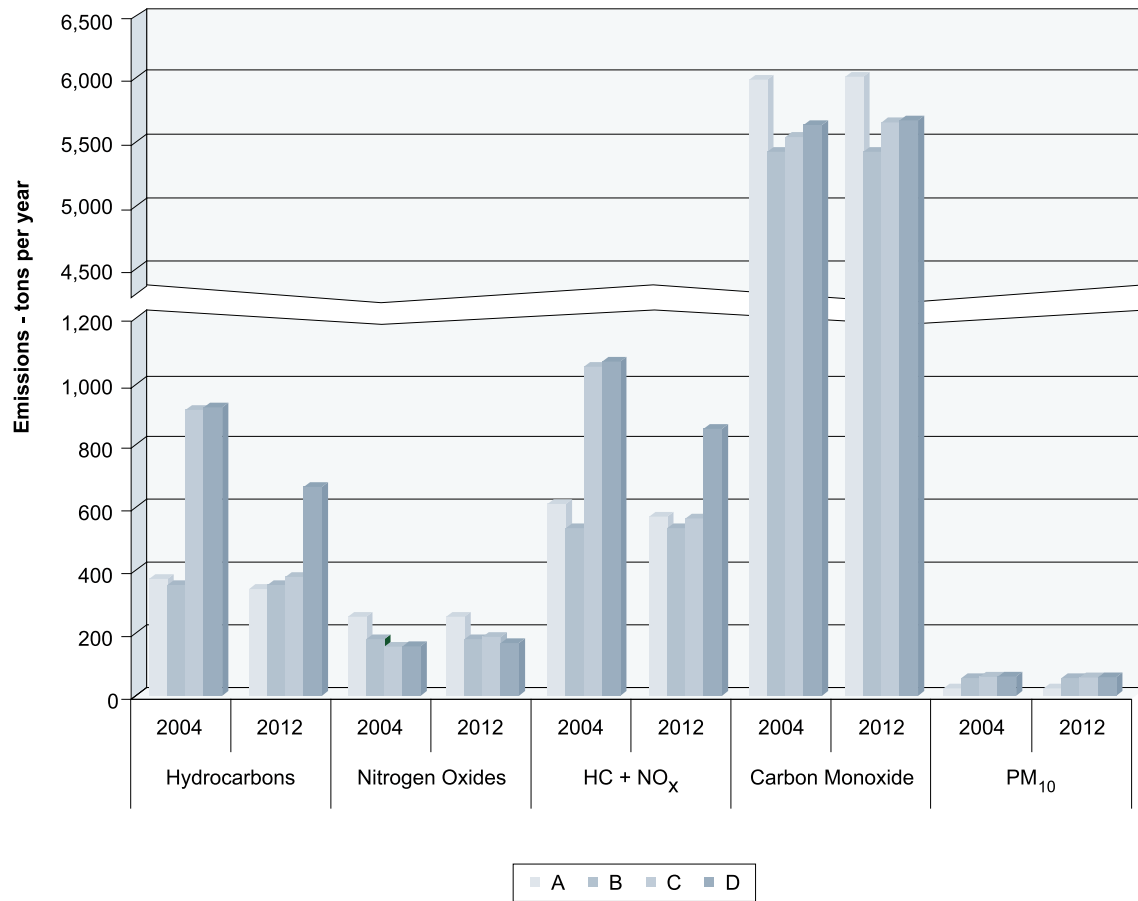


FIGURE 16: POLLUTANT EMISSIONS FOR 2004 AND 2012 — ALL WATERCRAFT

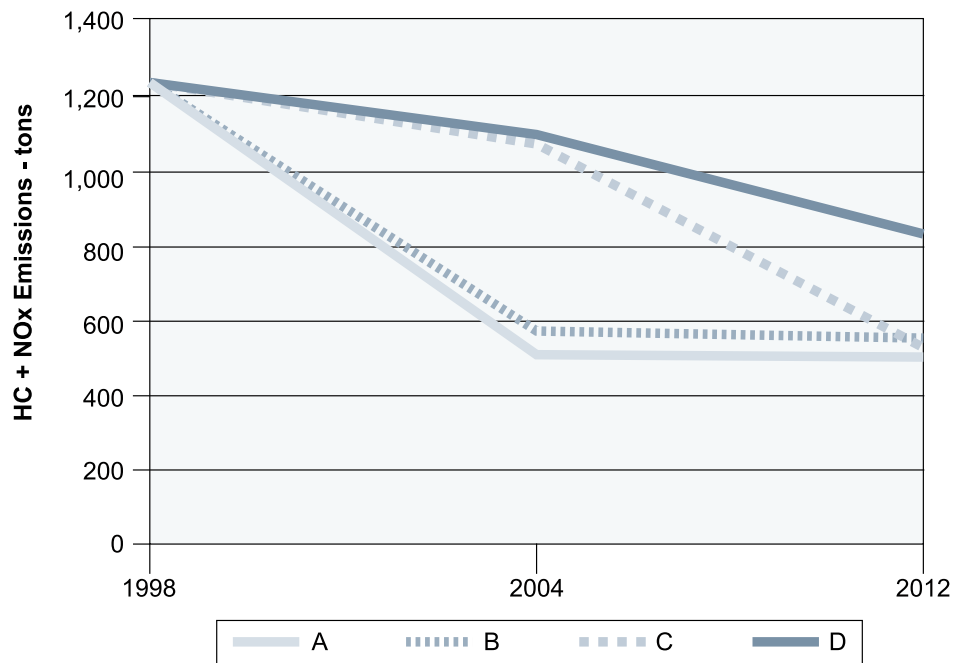


FIGURE 17: ANNUAL EMISSIONS, HC+NO_x — ALL WATERCRAFT

Under alternative A, there would be increases in carbon monoxide (CO) emissions compared to alternative D. This is because there would be more engine hours of operation under alternative A than under alternative D.

CO emissions would occur over the large area of the lakes. Using the threshold criteria, the impact to human health from the CO increase would be moderate, yet local CO concentrations would still be well within the national ambient air quality standards.

Total emissions of particulate matter (PM₁₀ and PM_{2.5}) would be reduced from 47 and 43 tons per year, respectively, under alternative D to 15 and 14 tons under alternative A by 2012. The impact on human health from particulate emissions would be negligible in the long-term.

In summary, compared to alternative D, emissions of HC, PM₁₀, and PM_{2.5} would decrease, while emissions of NO_x and CO would increase in alternative A. These trends would continue beyond 2012. The decreases in HC would be more than five times greater than the increases in NO_x, resulting in a reduction in the formation of ozone.

Impacts to Air Quality-Related Values from Watercraft Use

To assess the impact of ozone on plants, the five-year ozone index value was calculated and is represented as SUM06. National SUM06 values developed by the National Park Service Air Resources Division, based

on rural and urban monitoring sites, indicate SUM06 values in the 16 to 24 and 24 to 32 parts per million (ppm)-hour ranges.

The U.S. Forest Service Forest Health Biomonitoring Program has numerous biomonitoring stations in southwestern Utah and within the intermountain region, including Arizona, New Mexico, Nevada, Utah, Colorado, Wyoming, Montana, and Idaho. Based on this monitoring, ozone-induced injury to plants has not been detected within this region (Forest Service, Boyer, pers. com., June 2002).

As described in the human health impact analysis, alternative A would result in a potential reduction of regional ozone formation. This would lead to a potential reduction in the SUM06 index. Based on the lack of evidence of ozone injury to plants, and the anticipated reductions in ozone formation, but recognizing the existing SUM06 index, the estimated level of long-term adverse impact on air quality-related values would be moderate.

Particulate matter and NO_x emissions can degrade visibility. In the presence of sunlight, NO_x can contribute directly to haze. Under alternative A, PM_{2.5} emissions would be reduced by 31 tons in 2004 and 29 tons in 2012. The reduction in particulate emissions would tend to improve visibility, and the increase in NO_x emissions from watercraft activity in high-use areas would tend to degrade visibility during peak-use periods. The long-term adverse effects of these pollutants as a result of implementation of alternative A on visibility would be negligible to minor.

Impacts of Personal Watercraft Use

The elimination of personal watercraft under alternative A would be expected to decrease visitor use of the recreation area, resulting in a decrease in all emissions in the first few years following the ban. Former personal watercraft users would return to the recreation area with other types of motorized craft, and the total number of boat trips per year spent on Lakes Mead and Mohave would increase to 327,876, as shown in table 45 in the “Methodology” section of this chapter. As explained in the above analysis, under alternative A, there would be no pollutant emissions from personal watercraft in the short- and long-term. Compared to alternative D, by the year 2012, the ban would eliminate personal watercraft emissions of over 1,947 tons of carbon monoxide and 467 tons of hydrocarbons. Other pollutants would be eliminated as well (refer to table 51). The net effect of eliminating personal watercraft in alternative A, when compared with alternative D, is somewhat offset with the greater number of engine hours of operation in alternative A.

Impacts from Construction

Construction projects proposed in this alternative would have short-term effects on air quality in the Colorado River watershed. There would be exhaust emissions from the engines of heavy equipment used for the proposed expansion of existing facilities at Callville Bay, Temple Bar, and Cottonwood Cove.

Construction activities would likely release moderate amounts of dust into the air. Although air quality would be impacted in the immediate vicinity of construction sites, these impacts would be minor considering they are localized and temporary. Mitigation measures, including dust abatement efforts, would reduce the impacts. Conditions existing prior to construction could be expected to return once projects are completed.

Under this alternative, existing access roads could be improved and paved to reduce fugitive dust resulting from vehicle use. However, not all parking areas around Lake Mead would be suitable for paving due to fluctuating water levels. Those areas not paved would continue to generate dust in a localized area from vehicle use and wind conditions. These are considered minor impacts as they would occur during windy periods or periods of high use and would create localized, temporary impacts on air quality.

Cumulative Impacts

There would be no incremental contribution to cumulative impacts from personal watercraft activity because personal watercraft use would no longer be permitted in the recreation area. However, emissions from other motorized vessels would continue.

The occurrence of days with poor air quality within the recreation area could tend to increase as development and construction increases outside the park boundaries in the adjacent communities of Boulder City, Henderson, Las Vegas, and Laughlin, Nevada, and Bullhead City, Arizona. Most of the air quality problems are created by dust, motor vehicle exhaust, and power plant emissions that are transported into the park by wind. Motorized vessel emissions, combined with emissions from outside the park, would result in a cumulative air quality impact. The ambient air quality levels in the park area for all criteria pollutants would be within the national standard.

Based on emission forecasts within the park, SUM06 ozone levels would remain at their present levels or would improve. However, the SUM06 levels could be degraded by ozone-forming pollutants transported from outside the park.

Short-term construction emissions would be confined to the local working area by the use of dust-control measures, such as applying water to roadway surfaces, and distance would prevent the impact from being cumulative with simultaneous projects outside the park. To reduce air quality impacts relating to construction machinery, low-sulfur fuel (0.05% by weight) would be used, when available, and construction equipment would be properly tuned. These are the standard mitigation measures required by the National Park Service at Lake Mead Recreation Area, and they also comply with requirements of Clark County air quality standards.

Lake Mead National Recreation Area complies with federal and state regulations related to the *Clean Air Act* and hazardous materials. Any facility renovation within Lake Mead National Recreation Area first requires a licensed contractor to test the building components to determine if there are asbestos and lead contaminants present. If contaminants are present, contractors would be hired to remove the contaminants in accordance with state and federal standards and requirements.

Conclusion

Implementation of alternative A would eliminate personal watercraft from the park in the short- and long-term. Visitors would return with other types of vessels over the long-term, increasing the total engine hours of operation when compared to the baseline (alternative D). Even with the elimination of personal watercraft, other vessels would continue to operate carbureted two-stroke engines, and some of these watercraft would not convert to cleaner engines until some time after 2025. Under alternative A, there would be no pollutant emissions from personal watercraft in the short- and long-term. Compared to alternative D, by the year 2012, the ban would eliminate personal watercraft emissions of over 1,947 tons of carbon monoxide and 467 tons of hydrocarbons. Other pollutants would be eliminated as well. The net effect of eliminating personal watercraft in alternative A, when compared with alternative D, is somewhat offset with the greater hours of operation of other vessels in alternative A.

Criteria pollutant levels in the Lake Mead National Recreation Area would continue to be within national ambient air quality standards. No change in the class II airshed status would be expected.

The impacts on human health vary depending upon the pollutant. Impacts from HC and NO_x would be minor, CO would be moderate, and particulates would be negligible in the long-term. Some benefits would result from the elimination of personal watercraft emissions of HC, CO, NO_x, and particulate matter in the recreation area.

Impacts to air quality-related values would be moderate. PM_{2.5} reductions would contribute to an improvement in visibility, and the reduced ozone production would contribute to a reduced potential for plant damage. The impact is classified as moderate because of the existing SUM06 ozone index.

Construction impacts from fugitive dust would be short-term and minor, as particulate emission impacts would be minimized by the use of dust-control measures.

Implementation of this alternative would not result in an impairment of the air quality resource.

GEOLOGIC RESOURCES AND SOILS

Impacts

Additional development could add more acres to the total area of lands utilized due to the expansion of facilities approved under the *General Management Plan*. For the most part, any construction or expansion of existing facilities would occur on previously disturbed areas; therefore, the impacts would be minor. However, if expansion and development zones include areas not previously disturbed, soils would be permanently damaged due to compaction, and this could cause an increase in soil erosion and runoff. Rehabilitation and landscaping would lessen the scars and prevent the loss of soil through erosion; however, the natural productivity of these soils would be lost.

Impacts of Personal Watercraft Use

No impacts would occur on geologic resources and soils due to the ban on personal watercraft in the recreation area.

Cumulative Impacts

Desert soils in the surrounding communities are being impacted from construction activities and the associated growth in population; however, desert soils within the recreation area are protected. Illegal off-road vehicle use and construction activities cause the major impacts on desert soils in the recreation area. Restoration activities on these sites are occurring on a broad scale, and preventative measures are being employed to minimize future impacts. While there are currently construction activities taking place within the recreation area (e.g., the construction of the Southern Nevada Water Authority waterline), it would be unlikely the expansion of the Callville Bay, Temple Bar, and Cottonwood Cove developed areas would result in long-term significant impacts on soils. The expansion would occur adjacent to the existing sites, most likely in areas of previous disturbance. It would be unlikely the expansion of these developed areas would result in long-term, significant impacts on soils when considering the amount of undisturbed soil within the recreation area.

Conclusion

Some impacts on previously disturbed soils would occur at the expansion sites around Temple Bar, Callville Bay, and Cottonwood Cove. Soils not previously disturbed at the expansion sites could be altered by compaction, which could lead to increased erosion and soil loss. Mitigation based on site design and construction standards would reduce this impact. Overall, the impacts resulting from the expansion of developed areas within the recreation area or the construction of new facilities could, when combined, create moderate impacts. Development sites would be small in nature relative to the total protected acreage of the recreation area and would not result in the loss of the integrity of the geologic and soil resources; therefore, no impairment to soils would occur.

WATER RESOURCES

Impacts

Construction activities, including the expansion of developed areas, facility construction, and the paving of parking lots; human use and waste disposal; concession operations; offshore refueling; the use of motorized vessels; and the continued use of carbureted two-stroke engines could impact water quality.

Construction activities within and around the developed areas of Temple Bar, Callville Bay, and Cottonwood Cove could create the runoff of contaminants, including oil, from construction equipment and lead to increased erosion. Paving selected parking lots could lead to increased stormwater runoff, which could add more gasoline components, leaked motor oil, the asphalt itself, and air-deposited PAH from car and watercraft emissions into the lakes. The use of best management practices, including site design and the placement of berms and drainage systems, could reduce runoff and erosion. Because these impacts would occur in small, localized areas only during the construction period, these impacts would be considered minor.

Shoreline sanitation could deteriorate in high-use areas as visitor use increases over time, especially in the summer. The pollution associated with the improper disposal of human waste from visitors in the shoreline zones around the lakes would continue to threaten water quality. The bacterial monitoring program would continue at the marinas and high-use

areas and along the high-use backcountry beaches. If tests determine there are unsafe conditions, temporary closures of beach areas would occur. These impacts would be considered moderate impacts.

There are also social aspects related to water quality. The presence of human waste and associated debris could result in visitor avoidance of certain areas due to the appearance of poor water quality. This would affect park visitor distribution and could lead to even more areas being impacted by the improper disposal of human waste, resulting in moderate impacts on these areas.

Components of the concession operations at the marinas, especially those associated with fueling and boat maintenance, could impact water quality within the marina areas. The National Park Service provides guidance on best management practices for the handling of fueling areas and boat maintenance for concessioners and the boating public. The purpose of these practices is to reduce the pollutants entering the lakes due to fueling and boat maintenance activities and to promote environmental awareness among the primarily urban user groups. With the management requirements and public education reducing the levels of these impacts, the impacts would be expected to be minor. However, an accidental spill could occur and create moderate to major impacts in the marinas.

Pollution generated from spills during offshore refueling should decline on Lakes Mead and Mohave. According to observations, the primary user group that refuels in the water are personal watercraft users. With the ban imposed on personal watercraft under this alternative, there would be less overall offshore refueling. This beneficial impact would be most notable in the high-use coves during the peak-use seasons.

No additional protection of water quality would occur in the sensitive inflow areas of Lake Mead. Minor impacts on water quality could occur in those areas from the continued and increased use of motorized vessels.

Impacts on water quality from the use of carbureted two-stroke engines would occur primarily during the summer months, particularly in areas of concentrated boat use. In the long-term, as older models of these engines are replaced, the newer, more efficient models required under the EPA regulations would

eventually constitute the majority of boats using the lakes (after 2030).

Monitoring has shown the presence of fuel (including gasoline and associated additives such as [methyl tertiary butyl ether \[MTBE\]](#) and lube oil) in high-use areas of Lakes Mead and Mohave. This monitoring has shown the presence of the components of gasoline during the summer months, particularly in areas of concentrated watercraft use. Periodic monitoring for gasoline and gasoline additives would continue at selected coves. While these studies have shown that Lakes Mead and Mohave continue to meet *Clean Water Act* standards, standards for two of the compounds analyzed, benzene and MTBE, were approached in certain high-use areas. Both of these compounds are fairly volatile and their presence can be attributed to high levels of activity by motorized vessels. The presence of these compounds does not appear to threaten ecological communities. Monitoring did not include testing for PAH.

The water intake that delivers drinking water to the Las Vegas Valley is located at an elevation of 1,050 feet above mean sea level in Lake Mead, while the elevation of the lake surface is usually above 1,180 feet. This puts the intake at a depth of 130 feet or more. Gasoline compounds have not been detected in water samples regularly taken near the water intake by staff of the Southern Nevada Water System. In addition, the testing at water intake facilities has shown that levels of these compounds do not exceed state standards. Impacts on drinking water from these compounds would be considered negligible.

Gasoline components currently enter the lakes from boating use and from other sources such as fueling spills and parking lot runoff, but have not reached concentrations that [would adversely affect](#) the aquatic system of Lakes Mead or Mohave or human health. This is partially due to the size of Lakes Mead and Mohave and the relatively short-lived nature of the contaminants.

Existing monitoring by various state and federal agencies would continue in specific areas of Lakes Mead and Mohave [and could be expanded to include limited testing for some PAH compounds](#). This monitoring is mainly associated with the Las Vegas Wash inflow area at the intake facilities of the Southern Nevada Water Authority and at selected high-use coves on Lake Mead. Sampling would continue at the Virgin River inflow area and at various areas of the lake where water clarity is being

monitored. Usage could be temporarily curtailed in specific areas if monitoring indicates the presence of contaminants that exceed water quality standards.

Impacts of Personal Watercraft Use

Alternative A assumes the use of all personal watercraft would be prohibited in the park. All hydrocarbon pollution originating from personal watercraft in Lakes Mead and Mohave would be eliminated. There would be no negative impact to water quality from personal watercraft in this alternative. The positive impact on lake loadings from the elimination of personal watercraft would be short-term, because personal watercraft users could return over the subsequent years using other watercraft. Water quality effects from the redistribution of these users to other types of watercraft are included in the discussion of cumulative impacts for alternative A.

The most visible benefits of this alternative would [occur during the summer months](#) in the high-use coves, including Horsepower Cove, Saddle Cove, and Government Wash on Lake Mead, and Arizona and Nevada Telephone Coves and Cabinsite Point on Lake Mohave. A USGS sample found that gasoline compounds in the waters of selected coves during high-personal-watercraft-use periods were well [within](#) state standards.

Gasoline compounds have not been detected in water samples taken near the intake of the Southern Nevada Water System. Impacts on drinking water from the use of personal watercraft would [also](#) be eliminated under this alternative.

Impacts of Other Marine Engine Use

Watercraft using carbureted two-stroke outboard engines would still be allowed to operate under alternative A. In 2004 this engine type would contribute 27% of the total pollutant loading of hydrocarbons in Lake Mead, and that figure would be reduced to 17% in 2012. The total loading of hydrocarbons in Lake Mohave would be 65% in the year 2004, and would be reduced to 48% in 2012.

“Table 52: Impacts of All Watercraft on Surface Water Quality under Alternative A,” compares calculated threshold volumes of water and depth of

water required to meet the specified water quality standards for all alternatives.

As discussed previously, the pollutant loadings were estimated using extreme adverse conditions including

Using the minimum pool size

Using the most shallow thermocline (30 feet)

Using boat capacity levels that would only be found during the heaviest use period on a normal size lake pool

This analysis demonstrates that under extreme adverse conditions the quantity of water available in the mixing zone at both Lakes Mead and Mohave are more than sufficient to meet the threshold volumes required to meet ecological benchmark standards. However, even with the elimination of personal watercraft, moderate impacts on water quality could occur during the summer in high-use areas or in

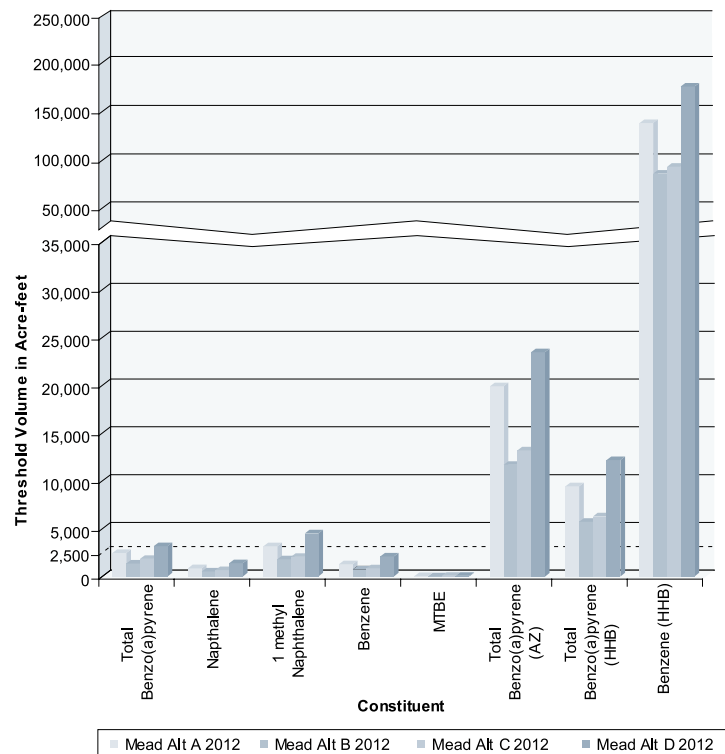
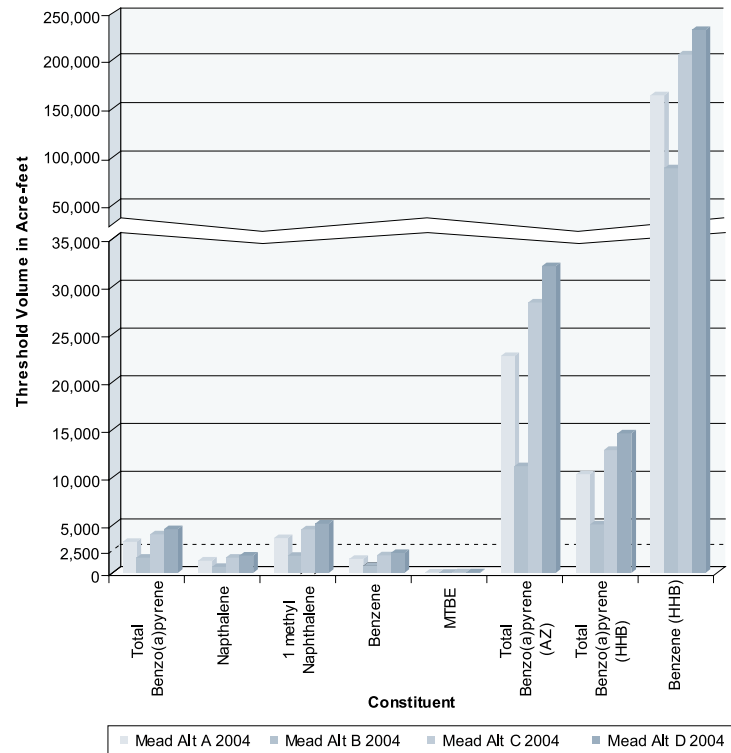
coves where water flow is limited and where there is a lack of sanitation requirements. Antidegradation requirements could be surpassed during high-use periods, and certain areas could be temporarily or permanently closed to recreational use.

Figures 18 and 19 show the volume of water for each constituent that would be required to meet the water quality standards described in “Table 50: Toxicity Benchmarks,” for both Lakes Mead and Mohave. These figures make it possible to compare the impacts from the alternatives to each constituent.

The volume of water in Lake Mead available to meet the threshold volumes identified is about 2 million acre-feet. Of all alternatives, the human health benchmark for benzene in alternative D in 2004 requires the largest threshold volume of water (approximately 226,000 acre-feet, or 11% of the available mixing zone). The threshold volumes required for all constituents, under all alternatives in both 2004 and 2012, are within the available water volume for mixing in Lake Mead.

TABLE 52: IMPACTS OF ALL WATERCRAFT ON SURFACE WATER QUALITY UNDER ALTERNATIVE A

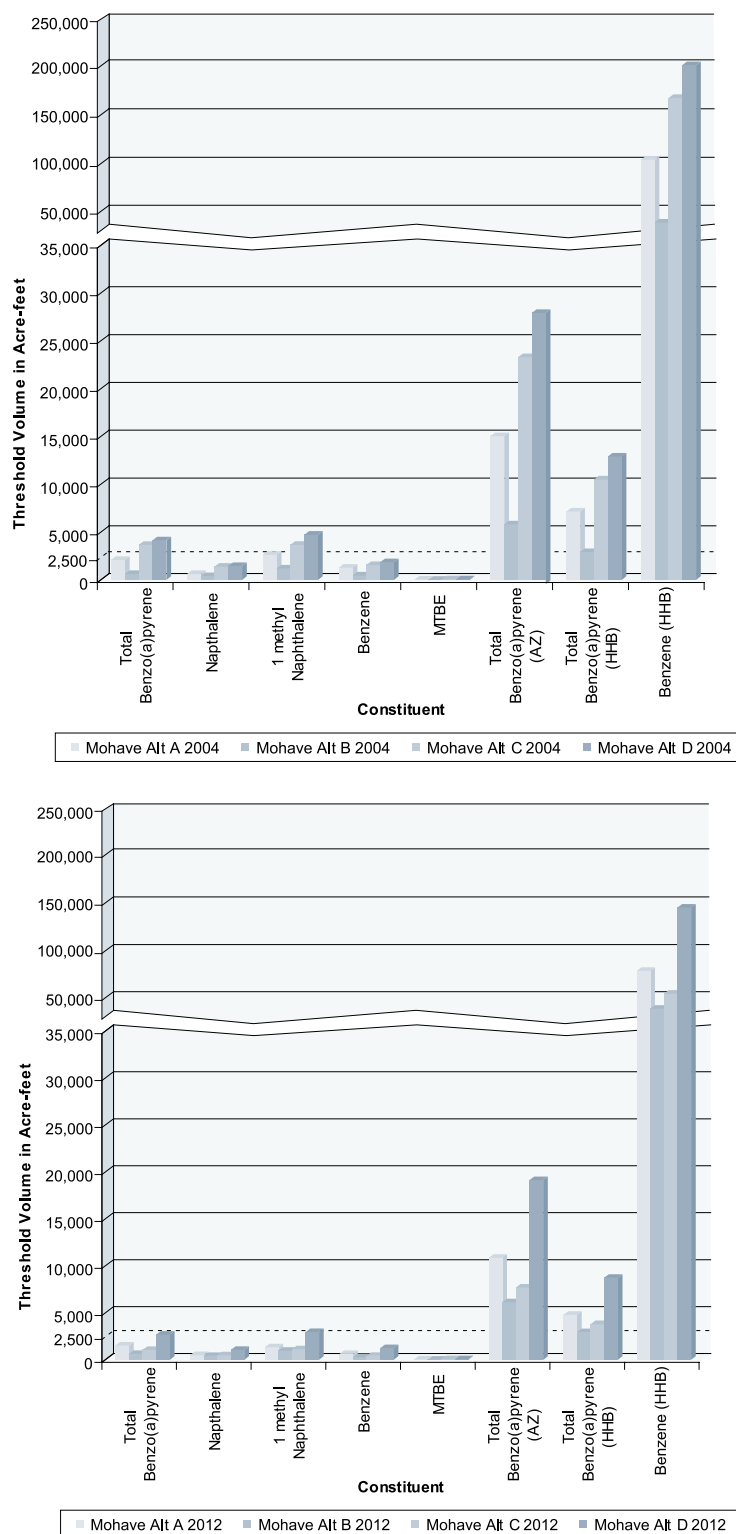
Threshold Volume or Depth of Water Needed to Meet Water Quality Standards									
Criteria	Constituent	Lake Mead 2004		Lake Mohave 2004		Lake Mead 2012		Lake Mohave 2012	
		Volume (af)	Depth (feet)	Volume (af)	Depth (feet)	Volume (af)	Depth (feet)	Volume (af)	Depth (feet)
Ecological Benchmarks	Benzo(a)pyrene	3,248	0.03	2,065	0.08	2,743	0.02	1,503	0.05
	Napthalene	1,286	0.01	817	0.03	1,086	0.01	595	0.02
	1-methyl Naphthalene	3,654	0.03	2,323	0.08	3,087	0.03	1,691	0.06
	Benzene	1,473	0.01	937	0.03	1,245	0.01	682	0.02
	MTBE	47	0.00	30	0.00	39	0.00	22	0.00
Arizona Standards for fish consumption	Benzo(a)pyrene	22,737	0.20	14,452	0.53	19,204	0.17	10,518	0.38
Human Health Criteria	Benzo(a)pyrene	10,335	0.09	6,569	0.24	8,729	0.08	4,781	0.17
	Benzene	159,627	1.41	101,458	3.70	134,824	1.19	73,845	2.69
Notes:									
af = acre-feet									
Lake Mead minimum pool – elevation 1,150 feet; total volume 16,440,000 af; volume above thermocline 2,085,000 af; surface area 112,890 square feet.									
Lake Mohave minimum pool – elevation 634 feet; volume 1,460,000 af; volume above thermocline 687,800 af; surface area 27,455 square feet.									



Lake Mead volume of water above thermocline (used as mixing zone) is 2,085,000 acre-feet, and surface area is 112,890 square feet

Refer to "Table 50: Toxicity Benchmarks," for an explanation of water quality standards for constituents

FIGURE 18: COMPARISON OF THRESHOLD VOLUMES REQUIRED TO MEET WATER QUALITY STANDARDS, LAKE MEAD



Lake Mohave volume of water above thermocline (used as mixing zone) is 687,800 acre-feet, and surface area is 27,455 square feet

Refer to "Table 50: Toxicity Benchmarks," for an explanation of water quality standards for constituents

FIGURE 19: COMPARISON OF THRESHOLD VOLUMES REQUIRED TO MEET WATER QUALITY STANDARDS, LAKE MOHAVE

The volume of water in Lake Mohave available to meet the threshold volumes identified is about 688,000 acre-feet. Of all alternatives, the human health benchmark for benzene in alternative D in 2004 requires the largest threshold volume of water (approximately 193,000 acre-feet, or 28% of the available mixing zone). The threshold volumes required for all constituents, under all alternatives in both 2004 and 2012, are within the available water volume for mixing in Lake Mohave.

Under alternative A at Lake Mead in 2004, the constituent that would require the largest threshold volume to be within the ecological benchmark criteria was 1-methyl naphthalene. The threshold volume required would be about 3,700 acre-feet, or less than 1% of the available mixing volume, to dilute the pollutant loading.

The human health benchmark for benzene is the most limiting standard of the state standard for fish consumption and the human health criteria. At Lake Mead, it would require a threshold volume of approximately 160,000 acre-feet, or approximately 8% of the available mixing volume of water in 2004; and 135,000 acre-feet, or approximately 15% of the available volume for mixing in 2012, to meet the standard.

At Lake Mohave in 2004, the human health benchmark for would require a threshold volume of approximately 101,000 acre-feet, or about 15% of the available mixing volume; and 74,000 acre-feet or about 11% of the available mixing volume in 2012, to meet the standard (see appendix G, appendix H, and tables H-1 through H-4).

The threshold requirements to meet standards for alternative A are less than those required under baseline (alternative D) conditions for all compounds evaluated because personal watercraft would be banned. The threshold volumes at Lake Mead required to meet water quality standards in alternative A are 29% less than threshold volumes required for alternative D in the year 2004, and 19% less than alternative D in the year 2012. Threshold volumes at Lake Mohave required to meet water quality standards are 47% less than alternative D in 2004 and 43% less than alternative D in 2012. Based on the impact threshold definitions, the effect from the use of all watercraft allowed under alternative A would cause negligible to minor adverse effects on the water quality of Lakes Mead and Mohave. Effects would be long-term, because they would recur

annually during the summer heavy-use seasons. These effects to water quality could sometimes be detectable in confined areas such as coves with high watercraft use. Chemical pollutant monitoring would be instituted to ensure that standards for all designated uses are protected. If monitoring determines that water quality standards are being violated, specific areas in the recreation area could require temporal or seasonal closures.

Impacts on Sensitive Aquatic Resources

No additional protective measures would be implemented under this alternative to protect the sensitive inflow areas of Lake Mead. The sensitive aquatic resources in these areas would continue to be exposed to the impacts of motorized vessels, including the deposition of fuel and fuel compounds. The expected growth in visitor use due to facility expansion would increase the total boating capacity to 5,975 boats for both lakes under this alternative and could lead to impacts associated with increased visitation, boating, and facility construction. These impacts include more fuel being deposited in the water from motorized vessels, fuel spills, construction runoff, and parking lot and road runoff. Impacts on water quality could be detectable in certain areas, and water quality standards could be temporarily exceeded, creating moderate impacts in these areas. These impacts are generally temporary due to the large volume of water in the lakes and the volatile nature of many of these compounds. These impacts occur primarily away from the sensitive inflow areas of the lakes, except at Las Vegas Wash where different water quality standards apply.

There would be no impacts from personal watercraft use as they would be banned from the recreation area under this alternative.

Cumulative Impacts

Cumulative impacts under alternative A would not include contributions from pollutants resulting from personal watercraft use, since personal watercraft would be prohibited.

Water quality concerns within Lake Mead National Recreation Area have focused on the inflow area at Las Vegas Wash and at the intake areas for the Southern Nevada Water System. The issues associated with Las Vegas Wash are being addressed

through the newly established Las Vegas Wash coordination committee and section 208 of the *Clean Water Act* that addresses urban runoff and non-point-source pollution issues. Further protection of Las Vegas Wash will be instituted with the development of the Clark County Wetlands Park, upstream of the recreation area. The wetlands park will serve as a nature preserve, providing erosion control and decreasing the amount of sediment flowing in the wash, and could, through natural processes, decrease pollutants associated with runoff flowing into Lake Mead.

Water samples regularly taken near the intake by staff of the Southern Nevada Water System would continue. Testing at water intake facilities has shown that levels of these compounds do not exceed state standards.

As the communities along the Virgin River grow, the focus on water quality issues would likely heighten concern at the inflow area of the Virgin River. These concerns are currently being addressed through the Lake Mead water forum, which includes issues dealing with Las Vegas Wash, water quality and human health, and the inflow of the Virgin and Muddy Rivers, and in the Northeast Clark County 208 Water Quality Management Plan Amendment (Clark County 2000b).

While water quality concerns have primarily focused on inflow areas, there are also concerns lakewide in terms of the disposal of human waste and the operation of carbureted two-stroke engines, which can contribute gasoline, gasoline additives, and PAH to the lakes. Continued and increased concentrated use along the shorelines of Lakes Mead and Mohave by swimmers, campers, and boaters, without the establishment of additional regulations related to sanitation and water quality, could create unsafe conditions and lead to the temporary or permanent closure of some high-use areas due to bacterial levels or the presence of dangerous compounds.

Conclusion

Even with the elimination of personal watercraft, moderate impacts on water quality could occur during the summer in high-use areas or in coves where water flow is limited and where there is a lack of sanitation requirements. Antidegradation requirements could be surpassed during high-use

periods, and certain areas could be temporarily or permanently closed to recreational use.

The threshold requirements to meet standards for alternative A are less than those required under baseline (alternative D) conditions for all compounds evaluated because, under alternative A, no personal watercraft are allowed. The threshold volumes at Lake Mead required to meet water quality standards in alternative A are 29% less than threshold volumes required for alternative D in the year 2004, and 19% less than alternative D in the year 2012.

Threshold volumes at Lake Mohave required to meet water quality standards are 47% less than alternative D in 2004 and 43% less than alternative D in 2012. Based on the impact threshold definitions, the effect from the use of all watercraft allowed under alternative A would cause negligible to minor adverse effects on the water quality of Lakes Mead and Mohave.

Reduced water quality could harm aquatic organisms through algae blooms, suspended solids and turbidity, and oxygen depletion. However, the lakes hold an immense amount of water, with a large volume of water flowing through the system.

Implementation of this alternative would not result in an impairment of the water quality resource.

VEGETATION INCLUDING SHORELINE VEGETATION

Impacts

Expansion of the facilities at Callville Bay, Temple Bar, and Cottonwood Cove could cause localized damage to vegetation. The vegetative community most impacted by these actions would be the creosote-bursage community, which is the dominant plant community within the recreation area. Topsoil would be removed and stockpiled and later replaced in restoration areas to help preserve the seedbank. Revegetation and landscaping with native vegetation would occur at these sites; however, there would still be areas of native vegetation lost to development. Impacts would be localized, but would cause a change in the abundance of the native plant community; therefore, the impact would be moderate.

Lake Mead and Lake Mohave do not have sensitive grasses and submerged aquatic vegetation near the

shoreline areas, except in the sensitive inflow areas of the Colorado, Virgin, and Muddy Rivers. Native species, such as willows and cottonwoods, do exist at certain shoreline areas, primarily in the sensitive inflow areas of Lake Mead and around Lake Mohave where water levels fluctuate only 15 feet per year. In addition, there are several rare or sensitive plant species that are located under the high-water line or within walking distance of the lake. These species could be directly impacted by recreational use, such as tree cutting for firewood or the trampling of small plants. These types of impacts would be considered minor to moderate impacts. Under the worst-case scenario, impacts could cause a change in the plant community by altering the abundance, quantity, and quality of plants over a localized area.

No additional shoreline zoning would occur under this alternative; thus, there would be no additional level of protection for sensitive plant species that could be located under the high-water elevation such as the sticky buckwheat, three-sided milkvetch, smoke tree, Las Vegas bearpoppy, sticky ringstem, and *Trixis californica* (no common name). Continued and increased visitor use in areas where these rare plants are located could damage the habitat by trampling and soil disturbance and decrease the number of plants in existence. However, since most visitor use is concentrated along the shoreline, which is below the high-water line for both lakes, the amount of high-quality habitat in these areas is low compared with the amount above the high-water line. As lake levels, which are regulated by the Bureau of Reclamation, fluctuate or as climatic conditions cause fluctuation, particularly of Lake Mead, habitat is removed by submersion or exposed as lake levels drop. This can destroy or create new habitat for these species. Lake levels are regulated by the Bureau of Reclamation; therefore, the impact of fluctuating lake levels could not be mitigated by the National Park Service. The impacts on rare plants under this alternative would be minor.

Along portions of Lake Mohave, nonnative salt cedar trees would be removed and native riparian species such as willow and cottonwood trees would be planted to restore the riparian community and improve the recreational setting. This would be a beneficial impact as native riparian habitat would be restored in these areas.

Impacts of Personal Watercraft Use

Since personal watercraft would be eliminated from the recreation area under this alternative, no impacts would occur on vegetation from personal watercraft users accessing shoreline areas.

Cumulative Impacts

Lake Mead National Recreation Area protects large, undisturbed portions of the Mojave Desert plant community in southern Nevada and northwestern Arizona. This habitat is being lost elsewhere in the area due to development and growth. Damage to vegetation at the expansion sites of Callville Bay, Temple Bar, and Cottonwood Cove would affect only small amounts of undisturbed desert on a localized basis in the development zones. With the majority of the more than one million acres of habitat being protected within the recreation area, the expansion of the three developed areas would not cause any long-term significant cumulative impacts on the dominant vegetative community within the recreation area.

The inundation of sensitive and rare plant habitat below the Lake Mead high-water level would be considered a potentially moderate to major cumulative impact. The Bureau of Reclamation controls lake levels, and though predicted lake levels show Lake Mead well below the high-water level over the next few years, there is the potential that levels could rise and inundate sensitive plant habitat. Lake levels have historically fluctuated, creating and destroying habitat. While the immediate effects of lake fluctuations could be major, and it would create highly noticeable and substantial impacts on these plant communities, it would be likely this habitat would be exposed again as lake levels drop and could regenerate.

Rare plant habitat is being lost in unprotected zones in the southern Nevada and northwestern Arizona areas, making all the federally managed lands in the area critically important to the overall survival of many of these rare species. Some habitat within the recreation area has already been lost due to the creation of Lakes Mead and Mohave. However, the full force of this impact is not known since historical information on rare plants is incomplete. Because some of the rare species are known only to exist within the recreation area, permanent loss of the species could occur if associated habitat is destroyed. Most habitat are outside the zones of concentrated

recreational use; in particular, there is no habitat within the designated urban park zone where the highest level of recreational use occurs. The majority of rare plant habitat would continue to be protected under this alternative. Lake Mead National Recreation Area would continue to serve as an area dedicated to the preservation and protection of these species. Lake Mead National Recreation Area would also continue to follow the protection guidelines established in the *Multiple Species Habitat Conservation Plan* (Clark County 2000a), in which the protection of the rare plant species is a goal.

With the exception of the fluctuating lake levels, native vegetation would be protected within the recreation area and no significant cumulative impacts on native vegetation under this alternative would be anticipated.

Conclusion

Impacts on vegetation from construction would be minor and localized within the construction site in development zones. With revegetation and landscaping of native species, some recovery of the area would be likely. If recreational use of rare plant habitat increases, some rare plant species habitat and individual plants could be damaged. However, Lake Mead National Recreation Area would continue to preserve large portions of rare plant habitat in the area. There would be no impact on vegetation from personal watercraft use as personal watercraft would be eliminated under this alternative. There would be no impairment to vegetation or vegetative communities from implementing the components of this alternative.

WILDLIFE AND WILDLIFE HABITAT

Impacts

The expansion of facilities at Callville Bay, Temple Bar, and Cottonwood Cove would disturb wildlife on a short-term basis during construction and could result in long-term or permanent impacts due to loss of habitat. The expansion and development areas would be located in areas previously disturbed by development, in areas where current development exists, or where the habitat is considered poor to marginal by biologists. Possible effects of construction noise and other activity would depend on the proximity to the construction sites, the time of

year, and the species affected. Most animals would be expected to avoid these areas during construction and may abandon nests or dens if construction occurred during critical phases of their breeding cycles. In some instances, permanent displacement of individuals could occur due to the loss of nest or den sites, roost sites, or protective cover, or due to a decline of food sources. Since it is considered marginal habitat, not critical to survival, and habitat is located nearby, impacts associated with the construction activities would be expected to be minor.

Impacts of construction near the lakeshore could also create runoff and increased silt and turbidity in aquatic habitats. For the most part, however, construction impacts would be short-term and minor. The timing of construction during the year and the day would do much to mitigate noise impacts. Impacts associated with habitat loss would not be expected to be significant due to the small acreage involved, the proximity to existing development (areas typically avoided by wildlife, particularly large mammals), the availability of undisturbed habitat nearby, and the restoration efforts that would occur after construction. Overall, impacts of construction activities would be expected to be minor due to these considerations.

No specific areas would be targeted for the additional protection of wildlife. The existing designated environmentally protected subzones would continue to emphasize the protection of wildlife species, including desert bighorn sheep. However, no restrictions on motorized uses would be implemented.

Many impacts on wildlife from the continued use of motorized vessels throughout Lakes Mead and Mohave are not known at this time. The most complete information available is on the impacts of motorized use on bird species. Park biologists have noted through field observations that bird species can be disturbed from the operation of motorized vessels. Motorized vessels are harmful to birds in two ways: creating noise that flushes the birds and creating wakes that disrupt nests (Burger 1998).

In particular, grebes, including Clark's grebes, build floating nests that could be damaged or flooded by the wake of a motorized vessel. Southwestern willow flycatchers sometimes build nests directly over the water, so a wake could damage the nest or knock it loose by hitting the branch or tree that it is built in.

Grebes and willow flycatchers are known to nest in portions of Lake Mead National Recreation Area. Clark's grebes have been sighted in the Pearce Ferry delta and in the inflow areas of the Muddy and Virgin Rivers. Surveys of Southwestern willow flycatchers have occurred over the past five years, and the birds have been found in the park during nesting season along Lake Mohave and in the inflow area of the Muddy River.

The noise of a motorized vessel can flush birds from their nests, which can be harmful or fatal to unfledged chicks. Young birds of any species are not able to thermoregulate (regulate body temperature) on their own and rely on their parents to keep them warm or cool. Flushing the adults frequently or for extended periods leaves the young susceptible to exposure (either the heat or the cold, depending on the time of day and the time of year). Also, young birds have incredible energy demands, and parents feed them continuously throughout the day. Keeping adults away from the nest can disrupt proper development of the young. Lastly, keeping adults away prevents them from defending the nest against predators.

These problems can affect any bird nesting in the area. Important nesting areas in the park occur at the inflow areas, including the Muddy and Virgin River areas, and in the Pearce Ferry delta, depending on lake elevation. Nesting also occurs in riparian areas, particularly in large stands of cottonwood and willow trees, and on cliff areas around both lakes. Some of the more sensitive species that exist and nest in the recreation area include the Southwestern willow flycatcher and the peregrine falcon, as well as blue grosbeaks, great blue herons, and Clark's grebes. The recreation area also receives potential use by vermilion flycatchers and yellow-billed cuckoos.

The nesting season for neotropical migrants is from May to September. However, many birds, like the herons, start nesting earlier. Therefore, primary nesting season directly correlates to the high-visitor-use season.

Additionally, while both motorized boats and personal watercraft use can disturb bird species, there have been conflicting reports on which use creates the most impact on birds. In general, boats can create a larger wake that can damage nest sites and create noise that can flush birds from their nests. However, boats ordinarily operate differently than personal watercraft. Boats tend to avoid shoreline and

vegetated areas or decrease speed when in these areas. Personal watercraft are known to focus their use in shoreline areas while operating at high speeds, which can create more extended periods of impact on bird species along the shoreline from noise and wakes. Overall, the impact on birds from motorized vessels would be considered a major impact. Motorized use occurs at critical periods during nesting season and migration periods. Habitat in the area is limited, and there could be an increase in mortality of these species based on the increasing use of motorized vessels in the inflow areas and around important nesting areas along Lake Mohave.

Impacts of Personal Watercraft Use

Personal watercraft would be prohibited throughout the recreation area. Impacts associated with personal watercraft use, including disturbance to wildlife species, particularly birds, would be eliminated. Wildlife would no longer be disturbed by the presence of personal watercraft in their habitat. However, other motorized vessels would still be present and use would increase under this alternative. As stated above, motorized vessels would continue to impact wildlife in all portions of Lakes Mead and Mohave. Therefore, the elimination of personal watercraft would create some beneficial impacts on wildlife and wildlife habitat.

Cumulative Impacts

Proposed facility construction would result in the disturbance or loss of wildlife habitat. The irretrievable commitment of this acreage to development precludes its use as wildlife habitat. Based on the amount of available habitat adjacent to or near the construction sites, it would be unlikely that construction would have significant cumulative impacts on wildlife habitat in the recreation area or in a regional context.

There could be potential cumulative impacts if visitation and use of the lakes by motorized vessels continues to increase, especially in sensitive inflow areas and near the nesting sites for bird species. Over time, bird species could abandon this habitat due to the increased disturbance by motorized vessels, and this could result in a loss of bird species diversity within the recreation area and potentially in the Southwest, as Lake Mead has been shown to be one

of the primary water courses for migratory bird species.

Conclusion

Wildlife would be temporarily displaced from the expansion areas due to construction activities. Wildlife species at construction sites that could not move from the area could be destroyed by construction activities. However, considering the small size of the impacted area and the availability of habitat nearby, this impact would be considered minor. This alternative would not provide any additional protection for wildlife species within the recreation area. Sensitive species around inflow areas could continue to be disturbed by motorized vessels. There could be moderate to major impacts on nesting bird habitat from the continued unregulated use of motorized vessels within sensitive roosting and nesting areas in the recreation area. The impacts associated with personal watercraft use would be eliminated. The impacts of implementing this alternative would not impair the wildlife in the recreation area.

THREATENED AND ENDANGERED SPECIES

Prior to undertaking any action, an assessment of its effects on endangered, threatened, proposed, or candidate animal species would be conducted in consultation with the U.S. Fish and Wildlife Service as necessary. Protection of these species would receive highest consideration in project planning.

Impacts

Desert tortoises have a patchy distribution at Lake Mead and throughout their range. Most of the park supports low densities of tortoises with a few hot spot of higher densities. Although monitoring plots and sign transects have helped identify areas of concern, it has not been possible to calculate accurate numeric densities for any area in the park. Methodologies for determining tortoise density have been debated for years and are still a major focus of discussion among biologists and land managers.

There have been sightings of desert tortoise close to both Callville Bay and Temple Bar and in the area

west of the Cottonwood Cove developed area, which is designated as critical habitat for desert tortoises.

Developed areas, parking lots, and boat launch areas, whether at Cottonwood Cove, Eldorado Landing, Stewarts Point, or Overton Beach, are located in marginal habitat with low tortoise densities, and management of these facilities poses little threat to the species. Access roads typically run through more suitable habitat, where the chance of tortoise impacts increases. Tortoise density is low near the access road to Stewarts Point. Tortoise densities near the access roads to Cottonwood Cove and Eldorado landing are low to medium but are particularly hard to quantify because drought-induced mortality has significantly reduced populations in those areas. The access road to Overton Beach poses the greatest concern. High tortoise densities have been found on a monitoring plot located near the intersection of the access road and Northshore Road, and tortoises are occasionally seen on the access road. Impacts to tortoises are considered in management of this area.

Vehicle-related mortalities associated with roads and illegal collection and harassment by people using the recreation area can adversely affect the desert tortoise. Area educational campaigns have probably helped to reduce this impact.

The proposed expansion of existing facilities at Cottonwood Cove is not within the Desert Wildlife Management Area, but it would be located close to threatened desert tortoise habitat. Since any construction activity would take place in previously disturbed areas of poor-quality habitat, it would not have a long-term detrimental impact on desert tortoise populations or habitat. Mitigation measures would be developed with the assistance of the U.S. Fish and Wildlife Service to reduce or eliminate any potential adverse impacts on desert tortoises from construction activities during the expansion of developed areas. Though neither Callville Bay nor Temple Bar are considered critical habitat, the same mitigation would apply to these areas. Due to the nature of these construction activities within desert tortoise habitat, there is the potential to adversely effect the desert tortoise from the loss of burrows or other habitat features.

As stated in the wildlife impacts section, motorized vessels can be harmful to bird species by creating noise and wakes. The listed bird species that are known to occur in the recreation area include the bald eagle and Southwestern willow flycatcher, and the

recreation area has potential habitat for the Yuma clapper rail and Western snowy plover. The sensitive peregrine falcon also exists within the recreation area.

Studies have shown that high recreational use can disturb wintering bald eagles (Stalmaster and Kaiser 1998). Eagles exhibit a wide range of tolerance to humans, and numerous variables can affect eagle response to human disturbance. The main impact on bald eagles from foot traffic and motorboats was the disruption of feeding activities. Flushing due to human intrusion during the early morning hours has been shown to interrupt feeding activities and can displace eagles.

Variables such as the width of the lake and the amount of recreational activity can affect the disturbance to eagles. Eagles are found throughout the recreation area in the winter. The wideness of the lakes, with the exception of a few narrow areas including the upper Black Canyon, Boulder Canyon, and the Virgin Narrows, provide a buffer from boating disturbance. Eagles are generally found in riparian areas within remote portions of the shoreline and on high cliffs or bluffs well above the lakes. Therefore, there is minimal or no direct disturbance from foot traffic. In addition, bald eagles are present within the recreation area during periods of the lowest visitor use and have not used the areas for nesting. Therefore, the increased visitor use during the summer would not likely adversely affect bald eagles.

Peregrine falcons are considered a sensitive species. They nest on cliff sites adjacent to Lakes Mead and Mohave. The known nesting sites are located away from the development zones. The additional proposed facilities under this alternative are not near known nesting locations. According to surveys, in the past five years peregrine falcon numbers have increased within their habitat zones throughout the recreation area. Boating activities have not been shown to adversely affect peregrine falcons or their habitat. This alternative would not likely adversely affect peregrine falcons.

No additional protection would be zoned in areas of known willow flycatcher habitat, including the inflow areas of Lake Mead and some shoreline areas of Lake Mohave. The effects of recreational use proximate to willow flycatcher habitat includes nest disruption and noise. These impacts were described in the "Impacts on Wildlife" section. It can be conjectured that some

level of motorized use close to willow flycatcher habitat could disturb this species and cause them to abandon the area. Nests are generally located over the water, so they can be susceptible to large wakes from motorboats. Noise from motorized vessels could cause nest abandonment. Known nesting sites have been confirmed in the inflow areas around the Virgin River, and there have been sightings, though no confirmed nest sites, on Lake Mohave. Nesting periods coincide with the peak recreational use period (June and July) for both lakes. Without special zoning or further protection of nesting sites, the willow flycatcher population at Lake Mead National Recreation Area could likely be adversely affected.

The sensitive California brown pelican has been sighted within Lake Mead National Recreation Area. This bird is considered a transient visitor to the recreation area. No effect would occur to the California brown pelican as a result of this alternative because this species is only an occasional visitor, and no nesting activities are known to occur within the recreation area.

Potential habitat for Yuma clapper rail and the Western snowy plover does exist within the recreation area. Yuma clapper rails have been recorded [outside of the recreation area boundary](#) on the northern portion of Overton Arm at the Muddy River inflow area, and potential habitat exists at the Virgin River inflow near Las Vegas Wash and south of Davis Dam. Western snowy plover are migratory visitors to the recreation area. Biologists have seen plovers along Lake Mohave in the spring and fall, though they are a rare transient. Potential habitat for the Western snowy plover is located at the Virgin and Muddy Rivers inflow areas, at the Pearce Delta, and at Las Vegas Wash. Under this alternative, the Muddy River inflow area would continue to be protected from the restrictions on motorized use related to the management of the Overton Wildlife Management Area. No additional protection would occur at the Virgin River inflow, at Las Vegas Wash, or at Pearce Delta. This alternative would not likely adversely affect these species since no critical habitat is located within the recreation area for these species and they are considered rare transient visitors.

The impacts of recreational use, including boating, on endangered razorback suckers and endangered bonytail chub, have not been thoroughly studied within the recreation area. Razorback suckers spawn from January through early April and occupy specific shoreline areas at this time. The fish are more

sensitive to disturbance during this period. Biologists studying the razorback sucker for the past 10 years have noted that the use of motorized vessels in and around the razorback sucker spawning aggregations along the shoreline of Lake Mohave causes a great deal of turmoil (Marsh 2001). Passing watercraft interrupts spawning, displaces staging and spawning fish, disturbs substrates, and generally bothers the fish, their behavior, and their habitat. This is especially a concern where fish are using the shallower shoreline areas where boat motors, and their noises and turbulence, are in close proximity to the fish. These impacts would temporarily disturb spawning fish and disrupt spawning activities. The same type of disturbances would be likely for bonytail chub, which spawn later in the spring into May.

As razorback spawning occurs during periods of low visitor use, increased visitor use during the summer would not adversely affect razorback suckers. However, if use increases in the spring and fish are disturbed on spawning beds more frequently, increased recreational use would likely adversely affect razorback suckers.

Bonytail chub are known to spawn during May, when increasing numbers of visitors are using the lakes. Impacts of recreational use on this species are unknown but would likely be similar to the razorback sucker in terms of the disturbance during spawning activities. Both fish species would continue to be monitored to determine if recreational use would create adverse impacts. If evidence shows these fish species were detrimentally impacted by recreational activities, the National Park Service would work with the Native Fish Work Group to determine what level of protection would be required to preserve these species.

In addition, the continued use of carbureted two-stroke engines and the expulsion of fuel unburned into the waters of razorback sucker and bonytail chub habitat could have detrimental impacts on the species by exposing them to gasoline and gasoline additives. While historical concentrations have not been shown to impair the health of the aquatic system, the long-term effects on the health of these endemic fish are not known.

Initially, the 35% reduction in motorized vessels on the lakes from the ban of personal watercraft should benefit these species. However, use could increase to existing levels or beyond in the future. Overall, the

existing and possibly increasing use by motorized vessels of the spawning areas during critical times for the razorback sucker and bonytail chub would likely adversely affect these species.

The stocking of game species is coordinated with the U.S. Fish and Wildlife Service, the Arizona Game and Fish Department, and the Nevada Division of Wildlife. The National Park Service would continue to coordinate with the fisheries management agencies to ensure the stocking of game species does not conflict with the management of the endangered native fish.

The relict leopard frog (*Rana onca*), while not a listed species under the *Endangered Species Act*, is a species of concern at Lake Mead National Recreation Area. This frog was once thought to be extinct, but populations have been found at several springs within the recreation area in the past five years. Some of these springs are near the lake and are destinations for water-based recreationists on Lake Mohave. Recreational use of these springs, particularly hiking into them and damming them could adversely affect frog populations in these areas. However, scientists studying these frogs have found that most visitors avoid the densely vegetated areas these frogs inhabit; therefore, impacts from recreational use have not been shown to detrimentally affect the frogs.

Impacts of Personal Watercraft Use

Sensitive habitats, particularly in the sensitive inflow areas, might be better protected after personal watercraft were banned from the recreation area under this alternative. Shoreline areas could also be better protected from the expulsion of emissions from carbureted two-stroke engines, currently on most personal watercraft in the recreation area (State of Nevada 1999b). Personal watercraft would no longer be using these areas; however, other motorized vessels, including other carbureted two-stroke engines, would still be authorized in these areas. Therefore, there would be some beneficial results from the ban on personal watercraft to threatened and endangered species.

Cumulative Impacts

Lake Mead National Recreation Area preserves important habitat of several species listed as threatened or endangered. While lands within the Las

Vegas Valley are being lost to development, lands within the recreation area and other federal areas around Las Vegas are given funding through the multiple species habitat conservation planning process to help further protect these species. This alternative would not add to the total amount of land protected in the region.

Lake Mead National Recreation Area provides important habitat to several species listed as threatened or endangered, including the desert tortoise, willow flycatcher, bald eagle, peregrine falcon, bonytail chub, and razorback sucker. These species depend upon the land base, riparian areas, or water resources for their survival. Of particular importance is the habitat Lake Mead National Recreation Area provides for the desert tortoise, bonytail chub, and razorback sucker. The expansion of the facilities at Cottonwood Cove could reduce the amount of available habitat for desert tortoises in that area. However, the expansion would occur in previously disturbed sites, which are considered poor-quality habitat and are not designated as critical habitat, and would not have a long-term detrimental effect on tortoise populations within the recreation area.

The impoundment of the Colorado River and the creation of the artificial reservoirs of Lakes Mead and Mohave have resulted in the removal or decline of endemic fish species in both lakes. This, along with the introduction of nonnative fish, has led to their overall decline in the Colorado River system. A Native Fish Work Group comprised of biologists from various agencies has been formed to work for the survival of the razorback sucker and bonytail chub in Lake Mead National Recreation Area. Their work has included egg and larvae collection and fish rearing, monitoring, and research. The National Park Service would continue to work with this group in an attempt to preserve these species within the lakes.

Conclusion

Under the evaluation of section 7 of the *Endangered Species Act*, the determination has been reached that this no-action alternative would have no effect on the California brown pelican; would not likely adversely affect the bald eagle, peregrine falcon, Yuma clapper rail, and Western snowy plover; and would likely adversely affect desert tortoise, willow flycatcher, razorback sucker, and bonytail chub. The ban of personal watercraft would have beneficial effects on

sensitive habitat in the inflow portions of Lake Mead from removing the noise and disturbance from these vessels and eliminating the emissions from personal watercraft.

Mitigation measures related to construction activities should serve to reduce or eliminate any potential impacts on these species. Monitoring would continue to determine if recreational use is impacting endemic fish species or the willow flycatcher.

There would be no impairment to threatened, endangered, or species of concern from the impacts resulting under this alternative.

CULTURAL RESOURCES

Impacts

Site-specific plans for the expansion of the developed areas at Callville Bay, Temple Bar, and Cottonwood Cove have not been developed. To protect cultural resources and to comply with the *National Historic Preservation Act*, all proposed projects would be evaluated to determine the area of potential effect. These areas would be inventoried for significant cultural resources, and a determination would be made as to what impact the project would have on the historic qualities of the resources. Through consultation with project designers, affiliate tribal entities, the respective State Historic Preservation Offices, and the Advisory Council on Historic Preservation, a plan would be developed to avoid or mitigate impacts.

Continued recreational use of springs near the lakeshore, which are considered sacred sites, could temporarily alter the cultural landscape of these areas through illegal activities, such as the deposition of litter and debris and the placement of graffiti. The National Park Service has been working to reduce the impacts on these areas from recreational use by educating the public and working with park staff and volunteers to clean up and rehabilitate damaged areas. Current use of these areas creates minor, temporary impacts. However, increased use could result in major impacts if the character of the setting is permanently altered.

Impacts of Personal Watercraft Use

No impacts would occur to cultural resources from the ban of personal watercraft in the recreation area.

Cumulative Impacts

Lake Mead National Recreation Area protects numerous cultural resources, including cultural landscapes, within its boundaries. Specialists from Lake Mead National Recreation Area work with outside entities and other federal agencies to preserve and protect cultural resources throughout the Las Vegas area and in the region. Continued protection of these resources is a primary concern, and land protection measures are being developed throughout the area that supports cultural resource preservation. Even with this protection, impacts do occur in the area on cultural resources. There are proposed and approved construction projects nearby Lake Mead National Recreation Area that have the potential to alter the character of cultural properties. This serves to add to the importance of preserving the cultural resources within Lake Mead National Recreation Area.

No significant cumulative impacts on cultural resources would be anticipated by the expansion of the developed areas at Callville Bay, Temple Bar, and Cottonwood Cove.

Conclusion

Site design and coordination with the cultural resources manager would ensure that no cultural resources are damaged under this alternative. Rehabilitation efforts would continue in cultural landscape areas that have been damaged by visitor use.

VISITOR USE, EXPERIENCE, AND SAFETY

Impacts

Under this no-action alternative, the lakes would be managed primarily for urban park and urban natural conditions with a small percentage managed as rural natural.

In these urban areas, boating densities could approach four acres per boat and could exceed recommended lake carrying capacities. There would be intense visitor use with congestion and high social contact in the urbanized areas along the lakeshore. Shoreline zoning would be mandatory and exclusive in an attempt to reduce conflicts. As lake capacities are exceeded, high-use areas would become overcrowded, which could lead to visitor dissatisfaction and an unsafe environment. The high boating densities and overcrowding could create moderate to major impacts on the recreational experience. High boating densities could create safety hazards in some areas where concentrated use occurs. This could lead to more accidents, injuries, and fatalities, creating major impacts on the recreational experience.

There would be no areas specifically managed for primitive or semiprimitive recreational experiences. Encounters with other visitors and motorized vessels would be normal in all areas of the lakes, including Black Canyon on Lake Mohave. This could lead to visitor dissatisfaction by those visitors who use nonmotorized vessels. Since there would be no areas set aside for nonmotorized uses, the recreational experience of some user groups, such as kayakers and canoeists, could be displaced from the recreation area.

Conflict between the various user groups would continue. This occurs on a variety of levels: between different types of boating groups, between boating and nonboating groups, and between many of the shoreline user groups. Examples of these types of conflict are boaters coming too close to other boats or to waterskiers associated with boats. Boating and nonboating conflict centers around boaters coming too close to swimmers, SCUBA groups, and fisherman and the competition for shoreline space between fisherman, SCUBA groups, swimmers, sailboarders, and waterskiers.

There would not be a lakewide strategy developed for water-based recreation. Carrying capacity would continue to be based on physical harbor characteristics and not on the recreational setting and desired visitor experiences. There would be no effort on the part the National Park Service to provide a full range of recreational opportunities and settings. There are no primitive or semiprimitive zones where visitors can escape the sounds of motorboats. There would be no clear direction for the development of facilities. All parts of the lakes could become more

alike, resulting in a single recreational setting for both Lakes Mead and Mohave.

Facilities would continue to operate at or near capacity during summer weekends and exceed capacity on summer holiday weekends. Launch lines would develop for a short duration at most launch ramps, while Katherine Landing would have a 30-minute or longer wait for boat launching.

There would be no [flat-wake](#) zones established around visitors in the water or at the shoreline and no new initiatives, other than adherence to state laws, would be pursued on boating education. Sanitation on the lakes would continue to be served by 40 shoreline restrooms.

Shoreline sanitation would not improve as there would be no requirements for the use of portable toilets. In high-use areas, the recreational experience of some visitors might be moderately impacted by the presence of human waste and related trash.

Glass and other litter would continue to be a problem within the recreation area and could cause moderate impacts on the visitor experience and safety concerns.

Impacts of Personal Watercraft Use

The ban on personal watercraft would result in a sharp drop in the number of boats on the water since they comprise 35% of the boats at any one time (Graefe and Holland 1997). Park managers estimate it could take as many as 15 years before boating numbers were back to, or exceed, existing levels.

Conflicts arising from irresponsible and unsafe personal watercraft use would be eliminated from the recreation area with the ban of these vessels. While some visitors would feel this is a beneficial impact on their experience, other visitors who are used to operating their personal watercraft on Lakes Mead and Mohave would experience major impacts from the ban. This user group, including the majority of the 11,000 registered personal watercraft owners in Clark County, Nevada, particularly those in the Las Vegas area, would be displaced from the recreation area. The majority of personal watercraft users would be forced to travel long distances to find areas that allow personal watercraft.

With the ban on personal watercraft use, there would be no personal-watercraft-related accidents in the recreation area each year. According to the Nevada State Boating Law Administrator, 33% of Lake Mead National Recreation Area boat accidents filed each year are related to personal watercraft use. Removing personal watercraft from the recreation area would reduce reported accidents by approximately 60, based on a three-year average of 176 reported accidents per year. While many feel that banning personal watercraft could result in fewer fatalities from water-related accidents, there is no available data from recreational area records that could confirm this.

Cumulative Impacts

Visitor experience and satisfaction would likely decrease under this alternative, which could lead to greater pressures from visitors for more services and recreational use zoning. As crowding increases, visitors may look elsewhere for their recreational experiences. This could impact visitor use in lakes in the region and throughout [Arizona](#), [Utah](#), [Nevada](#), and [California](#), as displaced visitors seek other opportunities for water-based recreation.

Conclusion

[In the short-term](#), this alternative would provide an improved recreational experience for visitors other than personal watercraft users [due to decreased boating levels resulting from the ban of personal watercraft](#). Visitor experience would likely deteriorate over time as boating levels climb back to or surpass the existing levels. There would continue to be visitor conflicts among different user groups other than personal watercraft users. Unsanitary conditions would continue to be a problem at high-use camping areas and beaches. While the restriction on the use of personal watercraft would reduce impacts from these vessels, including visitor conflict and accidents related to their use, in the long-term, the increasing boating densities would continue to create safety problems and could potentially cause more accidents on the lakes, creating moderate to major adverse impacts. This would occur when boating densities exceed current use levels.

Visitors would not have the full spectrum of opportunities to enjoy a variety of recreational settings within the recreation area. This would cause

certain visitors to be dissatisfied with their recreational experience.

SOUNDSCAPES

Impacts

Most visitors to Lakes Mead and Mohave have expectations of noise from motorized vessels during their visit. According to visitor use surveys, more than 60% of all visitors to the recreation area utilize motorized vessels as part of their experience (Graefe and Holland 1997). The noise impacts of boating on the park soundscape are limited primarily to park visitors, the natural soundscape, and wildlife at or near the shoreline. As one moves away from the lake into the canyons or into the desert vegetation, boating noise is increasingly diminished, but in the very quiet natural soundscape, boating noise can travel many miles depending upon terrain and other conditions.

Under this alternative, there would be no opportunity for a primitive or semiprimitive recreational experience on the lakes since no areas would be zoned for such purposes. Noise from motorized vessels would be audible in most areas on or near the lake surfaces, including the upper Black Canyon. Visitors who expect a quiet recreational experience where the natural sounds are predominant would be disappointed under this alternative, as those areas would not exist on the lakes. The natural soundscape and wildlife would be similarly impacted throughout the national recreation area. Also, since sound travels long distances in such an environment if not impeded by terrain or the factors, some of the more isolated regions of the recreation area could experience human-generated boating noises an impact level of moderate to major. However, in the less-primitive / more-developed zones, impact levels would be expected to be minor to moderate, since boating noise is generally consistent with the zoning and purpose of those areas.

Human-generated noise would be the dominant sound in the busy coves and developed areas, primarily during the summer. However, because there is an expectation that there would be noise in busy coves during the summer, the impact would be minor to moderate. Human-generated noise from motorized vessels being operated in areas away from the marinas and high-use areas would continue to occur.

Because boats are capable of operating at or above the state and federal noise standards and shoreline users, and other boaters can be exposed to boating noise for extended periods, the impact on the soundscape would be considered moderate. Under this alternative, the National Park Service would comply with the state of Nevada boating noise regulations. These regulations [limit noise to 75 A-weighted decibels when measured at the shoreline, independent of speed or distance](#), and are not based on specific noise levels at specific distances; therefore, they should be easier to enforce than the previous regulations. Because the Nevada State regulation would be easier to enforce, it is anticipated that the noise issues would be addressed and the shoreline and boating environment would be improved on both Lakes Mead and Mohave.

Shoreline users and other boaters could be exposed to boating noise for extended periods. In high-use and developed areas during the summer the impact on the soundscape could be considered minor to moderate. However, if the use was to intensify as under this alternative in the more isolated and remote portions of the lakes (or during the winter months when there are more expectations of natural soundscapes), this impact would be moderate to major.

In addition to the noise from the use of motorized vessels, there would be noise created from the construction activities during the expansion of the developed areas. This noise would be temporary, would occur only during the operation of heavy equipment (which would be localized within the existing development zones), and would generally be under 75 decibels. Noise from construction activities would be located around existing development areas and would be considered a minor temporary impact.

[Personal watercraft use would discontinue; however, eventually, other carbureted two-stroke \[marine vessels\]\(#\) would be replaced by direct-injection two-stroke and four-stroke models. Although the older models did meet state and federal noise standards, the newer two-stroke engines have been reported by the industry to be quieter than the older models. The full effect of this beneficial impact would not be realized until at least 2025 \[under this alternative\]\(#\).](#)

Impacts of Personal Watercraft Use

Personal watercraft would be banned from the recreation area; therefore, the noise associated with

their use would be eliminated. The primary difference between noise from personal watercraft and other boats seems to be the fluctuating nature of personal watercraft noise, which may be less than a design effect and more of a behavioral effect, because personal watercraft users make tight maneuvers and jump wakes. Personal watercraft also tend to “play” in small areas whereas other boats tend to travel more from one location to another, thereby increasing the time and in some cases apparent dominance of personal watercraft noise in localized “play areas.” As a result, the beneficial impact of banning personal watercraft would be most noticeable in the high-use coves that serve as “play areas” for personal watercraft during the peak season. It would be likely that boating noise would, to a large extent, replace personal watercraft noise in these areas as the carrying capacity would be authorized to expand under this alternative.

Cumulative Impacts

There are a variety of factors influencing the soundscape at Lake Mead National Recreation Area. In addition to the level of noise expected from the use of motorized vessels, there are several major highways and state roads that go through or skirt the recreation area that traffic noise also originates from. Much of the park is adjacent to BLM-administered lands. Many of these areas are remote and isolated, and some are potential or designated wilderness areas. These lands provide a buffer and help preserve the soundscape within remote portions of the recreation area. However, even in these remote portions, there is the potential for motorized noise from vehicles and aircraft.

Lake Mead National Recreation Area is proximate to the Las Vegas Valley. Air tours, by both fixed-wing aircraft and helicopter, frequent the skies over the recreation area. Their destinations are typically Hoover Dam and Grand Canyon National Park. Many remote areas of the park are impacted by this noise. With the development of an air tour management plan, park management hopes to work with the air tour industry to preserve the quiet in critical areas of the recreation area. In addition to air tours, commercial flights approach Las Vegas through the recreation area and several military training routes cross the national recreation area. Such aircraft are usually at greater altitudes than tour aircraft, but are often audible for long periods of time in the quiet, natural soundscape characteristic of

much of the national recreation area. In addition, people on the lakeshore can produce considerable noise through the use of generators, radios, boom boxes, and vehicle horns.

Conclusion

There would be no areas set aside to preserve the natural quiet on Lakes Mead or Mohave. As new regulations are imposed, and carbureted two-stroke engines are replaced by newer, quieter models, noise levels would be reduced on the lakes. Noise from personal watercraft would be eliminated from the lakes, and it is anticipated that they would gradually be replaced by additional boats. Overall noise from motorized vessels would be considered a minor to moderate impact in the less primitive areas, and a moderate to major impact in the more primitive areas. Construction activities would temporarily impact localized areas creating minor impacts. Considering the enabling legislation, the history of motorized vessel use at Lake Mead National Recreation Area, and the park’s goals and objectives to protect park resources and values, some noise from this source of recreational use is appropriate. Impacts under alternative A would not result in impairment to the park’s soundscape.

SOCIOECONOMIC RESOURCES

Impacts

Concession operations at Lake Mead National Recreation Area gross an annual combined income of \$45 million. The services called for in the *General Management Plan* would expand the facilities at Callville Bay, Temple Bar, and Cottonwood Cove and increase the overall annual income for these areas. The expansion of facilities could lead to higher visitation, which could directly increase, over the long-term, the amount of profit to concessioners providing services in these areas. In addition, with the growth in visitation to the recreation area, it is likely that other concession operations, adjacent communities, and the regional economy would benefit in the long-term.

Impacts of Personal Watercraft Use

The ban on personal watercraft would create moderate to major impacts on the concession-

operated marinas and create major impacts on businesses in the region that sell or rent these watercraft.

The concession's combined rental fleet consists of 96 personal watercraft. These watercraft generally rent for \$250 and up per day. During the summer months, particularly on the weekends, most of these vessels are rented. During the summer, some concessioners can gross approximately \$37,000 in one weekend from the rental of personal watercraft. According to the Lake Mead National Recreation Area Concessions Management Office, the ban could remove over \$1.2 million from their combined income, which would constitute a moderate to major impact, depending on the concessioner's overall income.

Area businesses that rent or sell personal watercraft would be negatively impacted by the ban. There are approximately 100 personal watercraft available for rent in the Las Vegas area, and a similar number are available in the Bullhead City / Laughlin area. Businesses that rent personal watercraft in the Bullhead City / Laughlin area have other water bodies available for use, including Lake Havasu and the Colorado River. However, rental businesses in the Las Vegas area rely solely on Lake Mead National Recreation Area as a destination for their renters.

There are three businesses in the Las Vegas Valley that rely on Lake Mead for the rental of personal watercraft, and around 20 retail businesses that sell personal watercraft. Each of the rental businesses can gross an income of approximately \$340,000 in one summer from their rental of personal watercraft. The rental season is generally characterized as the three-month period between Memorial Day and Labor Day (June, July, and August).

There are approximately 11,000 registered personal watercraft in Clark County, Nevada. This composes 28% of the total registered boats (39,000) in the county. The majority of these were purchased within the last 10 years. Sales nationwide peaked in 1995, and sales in the local area are believed to reflect the national market. The average price for a personal watercraft is approximately \$7,500.

Arizona does not separate boat type as part of the boat registration process and cannot provide a specific number of personal watercraft registered in the state. However, there are 18,000 boats registered in Mohave County, and it is estimated that 30%

(3,600) are personal watercraft (Arizona Game and Fish Department, C. Gafney, pers. comm., Oct. 10, 2001). These are concentrated in the communities of Bullhead City and Lake Havasu, which are located along the Colorado River. In contrast to Las Vegas, the ban of personal watercraft on Lake Mohave would likely result in the displacement of personal watercraft from Lake Mohave to alternative sites along the Colorado River including Lake Havasu. This could create crowded conditions on the Colorado River in the vicinity of Bullhead City and Laughlin, an area already described as crowded.

Water-based recreation is a popular activity. The majority of the 8 to 10 million annual visitors at Lake Mead National Recreation Area engage in some form of water-based recreation. Of those, the National Park Service estimates that between 80,000 and 145,000 individuals used personal watercraft in the recreation area during 2001 (NPS 2002b). Therefore, while personal watercraft users will clearly be affected by restrictions on their use, they constitute a very small minority of all visitors to the recreation area.

The National Park Service estimates that the total personal watercraft-related revenue of all identified personal watercraft rental shops, dealerships, and businesses servicing personal watercraft in the Lake Mead National Recreation Area is approximately \$25 million (NPS 2002b). This figure is quite small compared with the size of the regional economy. In 1999, total personal income in Clark County, Nevada, was approximately \$27 billion. Thus, even if all personal watercraft revenues related to the park were to disappear, as the National Park Service predicts under the most severe scenario for this alternative, the impact on the regional economy would be very small (<0.1% reduction in economic activity), although some businesses and communities in the county that rely heavily on personal watercraft users may experience localized impacts.

The National Park Service expects that revenues of lodging establishments, restaurants, and other tourism-related businesses in the region will be affected to some extent if personal watercraft use is restricted. However, the effects will likely be fairly small even under this alternative because a large portion of the personal watercraft users are local residents and expenditures by personal watercraft users from outside the region account for only a small portion of total tourism-related spending in Clark County.

In addition, it is possible that businesses relying on houseboat-related revenues could experience reductions in revenue if houseboat owners choose to go to other lakes because they can no longer use personal watercraft. However, based on interviews with local firms, the National Park Service does not anticipate a substantial reduction in visitation by houseboat owners. Most firms said there would be almost no impact on houseboat-related revenues. Overall, the National Park Service expects no measurable impact on the regional economy, although it is possible that some communities located near the recreation area may experience localized impacts (NPS 2002b).

Despite the fact that the National Park Service anticipates no measurable regional economic impact due to the personal watercraft regulations, it is very likely that personal watercraft dealerships, repair shops, and rental shops would see a decrease in revenue, especially under this alternative. Thus, it is expected that personal watercraft users who are no longer willing or able to ride at Lake Mead National Recreation Area following the change in regulations may stop using personal watercraft altogether.

Cumulative Impacts

Increased visitation could cause an increased pressure for development and the expansion of concession-operated facilities within the recreation area and could cause increased development on private lands outside the recreation area. Increased visitation would lead to the increased use of park facilities, and the condition of these facilities could deteriorate. If visitors consider conditions unacceptable, then over the long-term, there could be a decrease in park visitors, leading to a decrease in concession and local economy revenues. Considering the current condition of facilities related to the growth of visitation, this is a remote possibility that would be unlikely to occur.

The ban on personal watercraft from the recreation area could lead to increased visitation in nearby areas, including the Lower Colorado River and Lake Havasu. This could lead to increased accidents due to a high boating density in these areas, increased conflict, and a degradation of resources and facilities in those areas.

Conclusion

Socioeconomic resources within and outside the recreation area would benefit from increased visitation and expanded facilities at Callville Bay, Temple Bar, and Cottonwood Cove. However, this would be negated by the ban on personal watercraft, which could create a major negative impact on concession-operated facilities and businesses in the area that sell or rent personal watercraft.

PARK OPERATIONS

Impacts

Current levels of park staff would be maintained, including park interpreters, law enforcement, resource management, and maintenance functions. Studies have shown that the recreation area needs an additional 40 full-time law enforcement officers to effectively provide for visitor services and ensure protection of park resources; a 50% increase in full-time maintenance positions to provide for the upkeep and maintenance of facilities; 14 additional full-time and 1 part-time interpretive ranger position to provide for public education and interpretive services; and 16 additional full-time positions to adequately manage park resources. With the increase in visitation and facilities under this alternative, there could be moderate to major adverse impacts on park staff and operations as they attempt to keep up with the additional workload and duties created under this alternative.

Cumulative Impacts

Without the necessary personnel to provide protection, visitor services, and the upkeep and maintenance of facilities within the recreation area, park facilities and resources would not be adequately managed and would deteriorate. Over the long-term, if these conditions continue, there would not be adequate services or personnel to support the increasing number of visitors at Lake Mead National Recreation Area. Visitors could become frustrated and leave the area for other recreational opportunities elsewhere. If deficient field staff positions are filled, it would lead to an additional need for increased support staff related to park administration.

Conclusion

Staffing requirements are not being met to adequately provide visitor services and protection, facility upkeep and maintenance, interpretive and educational services, and resource protection and management. The Lake Mead staff is deficient in over 105 positions necessary to provide adequate visitor services and education, facility upkeep, and resource management.

SUSTAINABILITY AND LONG-TERM MANAGEMENT

This section evaluates the relationship between local short-term uses of the environment and the maintenance and enhancement of long-term productivity. It focuses on any irreversible or irretrievable commitments of resources that would be involved should this alternative be implemented and any adverse impacts that could not be avoided should this alternative be implemented.

Actions proposed under this alternative along the lakeshore area would not result in any significant loss

of long-term productivity because the land areas impacted are small in size and low in productivity compared with the remaining unaffected areas within the recreation area. New site development and the expansion of existing sites would cause irretrievable commitments of soil and vegetative resources. This would be reduced with the adoption of effective mitigation measures. However, all adverse impacts on the soil and vegetative resources could not be avoided under this alternative and would lead to the loss of habitat for wildlife species in the development and expansion areas.

The continued unrestricted use of carbureted two-stroke engines, along with the continuing problems with sanitation along the lakeshore, could adversely impact the water quality of the lakes, and recreational water quality standards could be exceeded during certain periods at certain locations. It would be unlikely that this impact on water quality would be an irreversible or irretrievable commitment of resources because of the size of the lakes. However, it could cause immediate impacts by forcing area closures, and there is the potential that reduced water quality could harm aquatic organisms with algae blooms, suspended solids and turbidity, and oxygen depletion.

IMPACTS OF ALTERNATIVE B

Under this alternative, facility development would be capped at the existing level. Existing shoreline areas would continue to be used for lake access and parking. Suitable parking areas would be paved under this alternative. This alternative would emphasize primitive recreational opportunities for visitors while protecting sensitive natural and cultural resources and restoring lakeshore areas previously degraded through overuse.

The major action under this alternative is zoning the lakes to include primitive and semiprimitive recreational settings or zones. Approximately 10% of the waters of Lakes Mead and Mohave would be zoned primitive or semiprimitive and would experience reduced boating levels and, in the case of the primitive setting, the elimination of motorized boating.

On Lake Mead, primitive areas would be established at critical inflow areas including the tributaries of the Muddy and Virgin Rivers. These areas would be relatively small and not affect recreational boating. The primary purpose of these small primitive areas is to protect the sensitive mixing area of the rivers and the lake. Additional primitive areas would be established from Pearce Ferry to Iceberg Canyon, including the Grand Wash Bay and Gypsum Bay areas of Lake Mead. As these bays are located away from the main channel of the lake, the prohibition of motors would primarily affect recreational and tournament fishing. The West Gypsum Bay area was formerly closed to all boating for use as a research area.

On Lake Mohave, Black Canyon would be managed as a primitive recreational setting, which would prohibit the use of motors in the canyon, with the exception of the concession-operated raft trips.

Another major component of this alternative is the immediate ban of all EPA-noncompliant two-stroke engines, including carbureted two-stroke personal watercraft, from the recreation area.

AIR QUALITY

Under this alternative, use of watercraft with carbureted two-stroke engines would be prohibited within one year upon approval of the plan. For

purposes of this analysis, it was assumed that final approval would occur in 2003, and there would be no carbureted two-stroke engines operating in 2004. It was assumed that the total use of the lakes by watercraft would be the same as if carbureted two-stroke engine watercraft had not been prohibited, and that mix of boat types would not change. Carbureted two-stroke engines would be replaced by cleaner engines.

Human Health Impacts from Airborne Pollutants Related to Watercraft Use

Under this alternative, use of watercraft with carbureted two-stroke engines would be prohibited in the park upon approval of the plan. For purposes of this analysis, it was assumed that final approval would occur in 2003, and there would be no carbureted two-stroke engines operating after 2004. It was assumed that the total use of the lakes by watercraft would be the same as if carbureted two-stroke engine watercraft had not been prohibited, and that mix of boat types would not change. Carbureted two-stroke engines would be replaced by cleaner engines.

Watercraft emissions of health-related pollutants were calculated for the years 2004 and 2012 according to the methods and assumptions described earlier in this chapter. Estimated emissions for alternative B are shown in table 51 (see the "Impacts of Alternative A" section of this chapter). The forecast emissions for 2004 and 2012 are identical because, after the elimination of carbureted two-stroke engines from Lake Mead National Recreation Area after 2004, there would be no change of engine mix within the park.

The Lake Mead National Recreation Area is an attainment area because the ambient air quality levels in the analysis area are less than the national ambient air quality standards. Existing emissions are similar to those shown in table 51 for alternative D in 2004. The Lake Mead National Recreation Area would continue to be in attainment under alternative B, as described below. No change in class II airshed status would result from this alternative, as existing personal watercraft and other watercraft activities have not resulted in the violation of any national ambient air quality standard. Alternative B would

result in reduced emissions, compared with the baseline (alternative D).

Under alternative B, hydrocarbon (HC) emissions would be 346 tons in 2004 and 2012, compared with alternative D (918 in 2004 and 659 in 2012). The reductions under alternative B would occur because all carbureted two-stroke engines would be eliminated after 2004. Under alternative B, elimination of these engines would result in HC emission reductions of 572 tons per year in 2004 and 313 tons per year in 2012, compared to alternative D.

An increase in NO_x emissions would occur under alternative B because NO_x emissions of other engine types are greater than those of carbureted two-stroke engines. As described in the “Methodology” section under “Applicable Emission Standards” in this chapter, the sum of HC+NO_x emissions is the standard of the EPA rule, and HC and NO_x are also the principal constituents of ozone. As shown in table 51, under alternative B, there would be a net reduction in HC+NO_x emissions of 552 tons per year in 2004 and 306 tons per year in 2012, when compared to alternative D, and a potential beneficial effect on regional ozone levels. The impact on human health from HC and NO_x would be minor in the long-term. This conclusion was based on the modeling results, the current ozone measurements, which are within the national standard, and the anticipated beneficial effect on regional ozone levels.

Under alternative B, elimination of carbureted two-stroke engines would result in CO emission reductions of 166 tons per year in 2004 and 215 tons per year in 2012, compared with alternative D. The impact to human health from CO emissions would be minor.

Total emissions of particulate matter (PM₁₀ and PM_{2.5}) would be reduced from 47 and 43 tons per year, respectively, under Alternative D to 33 and 30 tons under alternative B by 2012. The impact on human health from particulate emissions would be negligible in the long-term.

In summary, compared to alternative D, emissions of HC, CO, PM₁₀, and PM_{2.5} would decrease, while emissions of NO_x would increase in alternative B. The decreases in HC would be more than 20 times greater than the increases in NO_x, resulting in a reduction in the formation of ozone.

Impact to Air Quality-Related Values from Watercraft Use

As described for alternative A, the SUM06 index ranges from 16 to 32 ppm-hours, and ozone-induced injury to plants has not been detected in the region.

As described in the human health impact analysis, Alternative B would result in a potential reduction of regional ozone formation. This would lead to a potential reduction in the SUM06 index. Based on the lack of evidence of ozone injury to plants and the anticipated reductions in ozone formation, but recognizing the existing SUM06 index, the estimated level of long-term adverse impacts on air quality-related values under alternative B would be moderate.

Particulate matter and NO_x emissions can degrade visibility. In the presence of sunlight, NO_x can contribute directly to haze. Under alternative B, PM_{2.5} emissions would be reduced by 9 tons in 2004 and 6 tons in 2012, when compared to alternative D. The reduction in particulate emissions would tend to improve visibility, and the increase in NO_x emissions from watercraft activity in high-use areas would tend to degrade visibility during peak-use periods. The long-term adverse effects of these pollutants on visibility as a result of implementation of alternative B would be negligible.

Impacts of Personal Watercraft Use

Under this alternative, no change in the number of personal watercraft is forecast. However, after 2004, no personal watercraft powered by carbureted two-stroke engines would be allowed at Lake Mead National Recreation Area. The elimination of two-stroke personal watercraft under alternative B would be expected to decrease visitor use of the recreation area immediately following the action, resulting in a decrease in all emissions in the first few years following the ban. Personal watercraft users would return to the recreation area with cleaner engine watercraft, and the total number of boat trips per year spent on Lakes Mead and Mohave would increase to 311,907, as shown in table 45 in the “Methodology” section of this chapter. Compared to alternative D, by the year 2012, the engine conversions would eliminate personal watercraft emissions of 278 tons of hydrocarbons and 268 tons of HC+NO_x. Other pollutants would be eliminated as well (refer to table 51). The more efficient personal watercraft

engines would reduce the amount of unburned fuel that escapes from the exhaust and would improve the local air quality in high-use coves during periods of concentrated use by reducing smoke and gasoline-type odors.

Impacts from Construction

Under this alternative, existing parking areas would be improved and paved to reduce fugitive dust resulting from vehicle use. It would be likely under this and all alternatives that existing dirt parking areas would be paved. This would reduce local fugitive dust resulting from vehicle use and would result in a benefit to air quality in the area.

Since no further construction or expansion of existing facilities would take place, there would be no dust generated from construction activities.

Cumulative Impacts

Both personal watercraft and other watercraft would contribute to the cumulative air quality impacts. As described under alternative A, the occurrence of days with poor air quality within the recreation area could tend to increase as development and construction increases outside the park boundaries in the adjacent communities. Motorized vessel emissions, combined with emissions from outside the park, would result in a cumulative air quality impact. The ambient air quality levels in the park for all criteria pollutants would be expected to remain within the national standard.

Based on emissions forecast within the park, SUM06 ozone levels would remain at their present levels or would improve. However, the SUM06 levels could be degraded by ozone-forming pollutants transported from outside the park.

Conclusion

Implementation of alternative B would eliminate carbureted two-stroke engines from the park in the short- and long-term. Visitors would return with other types of vessels over the long-term. Although other engine types would replace the carbureted two-stroke engines, the replacement engines would be more efficient and there would be sizeable reductions in HC+NO_x emissions. There would also be reductions in particulate (PM₁₀ and PM_{2.5}) and CO

emissions. Compared to alternative D, by the year 2012, the conversion to cleaner engines required under alternative B would eliminate personal watercraft emissions of over 278 tons of hydrocarbons and 268 tons of HC+NO_x. Other pollutants would be eliminated as well. Criteria pollutant levels in the Lake Mead National Recreation Area would continue to be within national ambient air quality standards. No change in the class II airshed status would be expected.

The impacts on human health vary depending upon the pollutant. Impacts from HC, NO_x, and CO emissions would be minor, and particulate impacts would be negligible in the long-term. Some benefits would result from the elimination of two-stroke engine personal watercraft emissions of HC, CO, NO_x, and particulate matter in the recreation area.

Impacts to air quality-related values would be moderate. PM_{2.5} reductions would contribute to an improvement in visibility, and the reduced ozone production would contribute to a reduced potential for plant damage. The impact is classified as moderate because of the existing SUM06 ozone index.

Implementation of this alternative would not result in an impairment of the air quality resource.

GEOLOGIC RESOURCES AND SOILS

Impacts

No new disturbance would be authorized as development would be capped at existing levels; therefore, no impacts on geologic resources or soils would occur.

Impacts of Personal Watercraft Use

No impacts on geologic resources and soils would occur from the use of personal watercraft.

Cumulative Impacts

No cumulative impacts would occur.

Conclusion

No impacts on geologic resources or soils would occur. No impairment would occur to these resources as no impacts would occur as a result of this alternative.

WATER RESOURCES

Impacts

The Environmental Protection Agency requires personal watercraft manufacturers to improve the efficiency of engines by the year 2006 or discontinue their sale. A restriction on the use of watercraft that do not meet the EPA requirements would be put into effect at the recreation area in 2004. This restriction would eliminate gasoline and gasoline additives from being deposited into the lakes by carbureted two-stroke engines. Fuel used in carbureted two-stroke engines contains hydrocarbons, including benzene, toluene, ethylbenzene, and xylene (collectively called BTEX). Polycyclic aromatic hydrocarbons (PAH), comprised of benzo(a)pyrene, naphthalene, and 1-methyl naphthalene, are also released from engines, including those in personal watercraft. PAH, as well as other hydrocarbon emissions would be reduced as new four-stroke and direct-injection engines are required after 2004 under alternative B.

There would be no impacts on water quality from new construction activities since none are included under this alternative.

This alternative would improve shoreline sanitation. Data show that recreational camping on the shoreline, where facilities for human sanitation are not available, can impact shoreline water quality. The portable toilet requirements for all boats on the lake or at the lakeshore are included in this alternative. This measure, in the long-term, could have some beneficial effects on maintaining the shoreline water quality and sanitation. Additional boat pumpouts and portable-toilet dump stations would be constructed, and all shoreline accessible areas would have by vault toilets.

Components of the concession operations at the marinas, especially those associated with fueling and boat maintenance, could create minor to moderate impacts on water quality within the marina areas. The National Park Service provides guidance on best management practices for operating fueling areas and

boat maintenance for concessioners and the boating public. The purpose of these practices is to reduce the pollutants entering the lakes due to fueling and boat maintenance activities and to promote environmental awareness among the primarily urban user groups. With the management requirements and public education reducing the impact levels, the impacts would be minor. However, an accidental spill could occur and create moderate to major short-term impacts in the marinas.

Under this alternative, there is the potential that the offshore refueling of motorized vessels could continue to add gasoline and gasoline additives to the waters in high-use areas, producing moderate impacts on water quality in these areas. Stricter enforcement of regulations and increased education could help reduce this activity. Impacts of continued offshore refueling would be moderate because refueling activities would create detectable impacts during the busy season in several localized areas on Lakes Mead and Mohave.

The development of new facilities would be limited compared to the other alternatives, and although visitor use would continue at existing levels, motorized vessels would be reduced or eliminated from the primitive and semiprimitive areas, including Black Canyon north of Willow Beach and in the sensitive inflow areas. The total boating capacity under alternative B is the lowest of all alternatives considered, with 4,393 boats at any one time. Carbureted two-stroke engines would be replaced by direct-injection two-stroke or four-stroke engines. The reduced boating levels would result in less fuel being deposited in the lakes in these areas. In addition, the ban of carbureted two-stroke engines from the recreation area would improve water quality, particularly in high-use coves where concentrated use has occurred. However, changing from carbureted two-stroke engines to two-stroke direct-injection engines may result in increases of airborne particulate-associated PAH. Further research is needed to identify what impact this would have on PAH concentrations in water.

PAH, as well as other hydrocarbon emissions, could potentially be reduced as new four-stroke engines replace older carbureted two-stroke engines. The conversion of carbureted two-stroke engines is an important step toward substantially reducing petroleum-related pollutants.

The effects on drinking water would be the same as those described under alternative A.

To ensure that recreational activities at Lakes Mead and Mohave do not contribute to an exceedance of recreational water quality standards, a shoreline water quality monitoring program would be proposed that would systematically sample and test recreational waters at preselected sites. Current monitoring as described under alternative A would continue.

Impacts of Personal Watercraft Use

Alternative B assumes that carbureted two-stroke personal watercraft would be replaced by newer direct-injection two-stroke and four-stroke engines after 2004.

The most visible benefits of this alternative would occur during the summer months in the high-use coves, including Horsepower Cove, Saddle Cove, and Government Wash on Lake Mead, and Arizona and Nevada Telephone Coves and Cabinsite Point on Lake Mohave. A USGS sample found that gasoline compounds in the waters of selected coves during high-personal-watercraft-use periods were well within state standards.

Gasoline compounds have not been detected in water samples taken near the intake of the Southern Nevada Water System. Impacts on drinking water from the use of carbureted two-stroke engines would be eliminated after 2004 under this alternative.

Threshold volumes required to meet water quality standards for all constituents from personal watercraft under alternative B were the lowest of all alternatives for Lakes Mead and Mohave (figures 18 and 19). This is because alternative B used the lowest boating capacity of all the alternatives, and all carbureted two-stroke engines would be prohibited after 2004.

Under alternative B, in both years (2004 and 2012), personal watercraft would contribute 19% of hydrocarbon pollution in Lake Mead. In comparison, under alternative D in 2004, personal watercraft would contribute 54% of hydrocarbon pollution, and 44% in 2012. Therefore, the ban on personal watercraft after 2004 in alternative B would result in an overall reduction of hydrocarbons in both lakes in 2012 compared to alternative D.

Under alternative B, in both years (2004 and 2012), the maximum threshold required to meet the human health benchmark for benzene in Lake Mead would be approximately 15,000 acre-feet, or approximately 1% of the available mixing volume. In alternative D, maximum threshold volumes in 2004 required to meet the human health benchmark for benzene would be approximately 123,000 acre-feet, or approximately 6% of the available mixing volume. In 2012, under alternative D, the maximum threshold volumes would be approximately 74,000 acre-feet or approximately 4% of the available mixing volume.

Under alternative B, for both years (2004 and 2012), personal watercraft would contribute 63% of hydrocarbon pollution in Lake Mohave. In comparison, under alternative D in 2004, personal watercraft would contribute 73% of hydrocarbon pollution, and 71% in 2012.

Under alternative B, for personal watercraft in both years (2004 and 2012), the maximum threshold required to meet the human health benchmark for benzene in Lake Mohave would be approximately 25,000 acre-feet, or approximately 4% of the available mixing volume. In alternative D, maximum threshold volumes in 2004 required to meet the human health benchmark for benzene would be approximately 140,000 acre-feet, or approximately 7% of the available mixing volume. In 2012, under alternative D, the maximum threshold volume would be approximately 92,000 acre-feet, or 13% of the available mixing volume (see appendix G, appendix H, and tables H-5 through H-8).

Adverse impacts to water quality from personal watercraft use would be negligible to minor on both Lakes Mead and Mohave for the years 2004 and 2012. Effects would be long-term because they would recur annually during the summer heavy-use seasons. These effects to water quality could sometimes be detectable in confined areas such as coves with high watercraft use, but water quality standards or criteria would not be exceeded and would remain within historical or desired water quality conditions.

Impacts of Other Marine Engine Use

Under alternative B, no carbureted two-stroke personal watercraft or outboard engines would be allowed. Impacts from cleaner technology engines,

including personal watercraft and other marine vessels, were evaluated.

The maximum threshold volumes needed to meet water quality standards on Lake Mead in both years (2004 and 2012) would be approximately 78,000 acre-feet, or less than 4% of the total available mixing volume. This threshold would be required to meet the human health criteria for benzene.

The maximum threshold volume required at Lake Mohave in both years (2004 and 2012) to meet water quality standards would be approximately 40,000 acre-feet, or less than 6% of the available mixing volume. This threshold is required to meet the human health criteria for benzene.

The threshold volumes required to meet water quality standards in alternative B are 65% less than threshold volumes required for alternative D (baseline conditions) at Lake Mead in 2004. In 2012 the threshold volumes at Lake Mead are 53% less than alternative D.

The threshold volumes required to meet water quality standards in alternative B are 79% less than alternative D at Lake Mohave in 2004, and 69% less in 2012.

These impacts to water quality could sometimes be detectable in confined areas such as coves with high watercraft use, but would be well within water quality standards or criteria and within historical or desired water quality conditions. Effects would be long-term because they would recur annually during the summer heavy-use season.

Table 53: Impacts of All Watercraft on Surface Water Quality under Alternative B,” compares calculated threshold volumes of water and depth of water required to meet the specified water quality standards for this alternative.

Impacts on Sensitive Aquatic Resources

This alternative would better protect the aquatic system of Lakes Mead and Mohave by reducing the amount of gasoline or gasoline compounds that are released into the waters by eliminating carbureted two-stroke engines and restricting motorized vessels

from the sensitive inflow areas of the lakes. However, these compounds could still enter the lakes from other boat use and from other sources such as runoff, fuel spills, and from Las Vegas Wash, which is the primary outflow for the Las Vegas Valley. In certain locations where concentrated use occurs, such as near large parking facilities and around Las Vegas Wash, impacts could be detectable and water quality criteria could temporarily be exceeded, which would create moderate impacts in these areas. These impacts are generally temporary because of the large volume of water in Lakes Mead and Mohave and the volatile nature of these compounds. Plus, in most cases, with the exception of Las Vegas Wash, impacts are occurring away from the sensitive inflow areas.

Cumulative Impacts

The additional regulations related to sanitation and portable toilet requirements and the regulation restricting the operation of carbureted two-stroke engines should, in the long-term, improve the water quality of Lakes Mead and Mohave, particularly in the high-use areas. This, combined with the likely improved impacts on water quality in Las Vegas Wash from the establishment of the Clark County Wetlands Park as described under alternative A, would serve to improve the water quality of Lake Mead around and proximate to Las Vegas Bay.

It is expected that users of carbureted two-stroke engines would look elsewhere to recreate, and areas proximate to Lake Mead National Recreation Area could experience increased use. This could lead to concentrated use in areas such as the Colorado River below Davis Dam and Lake Havasu. Concentrated recreational use in these areas and increased use of carbureted two-stroke engines could moderately impact the water quality in these areas. Impacts would be temporary since the components are volatile in nature and would likely occur during the high-use season from May through September. As [direct-injection](#) two-stroke and four-stroke model engines replace the older model marine engines, these impacts should decrease considerably. The Environmental Protection Agency (EPA 1996a) expects that [conversion to cleaner engines would likely reduce the number of carbureted two-stroke engines by 75% by the year 2030.](#)

TABLE 53: IMPACTS OF ALL WATERCRAFT ON SURFACE WATER QUALITY UNDER ALTERNATIVE B

Threshold Volume or Depth of Water Needed to Meet Water Quality Standards									
		Lake Mead 2004		Lake Mohave 2004		Lake Mead 2012		Lake Mohave 2012	
Criteria	Constituent	Volume (af)	Depth (feet)	Volume (af)	Depth (feet)	Volume (af)	Depth (feet)	Volume (af)	Depth (feet)
Ecological Benchmarks	Benzo(a)pyrene	1,597	0.01	819	0.03	1,597	0.01	819	0.03
	Napthalene	632	0.01	324	0.01	632	0.01	324	0.01
	1-methyl Naphthalene	1,796	0.02	922	0.03	1,796	0.02	922	0.03
	Benzene	724	0.01	372	0.01	724	0.01	372	0.01
	MTBE	23	0.00	12	0.00	23	0.00	12	0.00
Arizona Standards for fish consumption	Benzo(a)pyrene	11,176	0.10	5,736	0.21	11,176	0.10	5,736	0.21
Human Health Criteria	Benzo(a)pyrene	5,080	0.05	2,607	0.09	5,080	0.05	2,607	0.09
	Benzene	78,463	0.70	40,268	1.47	78,463	0.70	40,268	1.47
Notes: af = acre-feet Lake Mead minimum pool – elevation 1,150 feet above mean sea level; total volume 16,440,000 af; volume above thermocline 2,085,000 af; surface area 112,890 square feet. Lake Mohave minimum pool – elevation 634 feet above mean sea level; volume 1,460,000 af; volume above thermocline 687,800 af; surface area 27,455 square feet.									

Conclusion

With the implementation of zoning, sanitation regulations, and [conversion to efficient engines](#), the water quality of Lakes Mead and Mohave would improve, especially in high-use areas and inflow areas. The beneficial effects on water quality under this alternative could result in detectable improvements to water quality in high-use coves during busy periods in the summer.

Adverse impacts from personal watercraft under alternative B would be negligible to minor because only personal watercraft using clean technology four-stroke or direct-injection engines would be allowed on Lakes Mead and Mohave.

Alternative B establishes the lowest boating capacity of all the alternatives, and would eliminate all carbureted two-stroke engines from the park by 2004. Although other engine types would replace the carbureted two-stroke engines, the replacement

engines would be cleaner, resulting in less pollutant load to the lakes.

Under alternative B the threshold volume of water required to meet water quality standards in both years (2004 and 2012) would be approximately 78,000 acre-feet, or less than 4% of the available mixing volume at Lake Mead, and approximately 40,000 acre-feet, or less than 6% at Lake Mohave. This would result in negligible to minor adverse effects on the water quality of Lakes Mead and Mohave. The threshold volumes required to meet water quality standards in alternative B are 65% less than threshold volumes required for alternative D at Lake Mead, and 79% less than alternative D at Lake Mohave in 2004.

Under alternative B threshold volumes required to meet water quality standards are 53% less than alternative D at Lake Mead, and 69% less than alternative D at Lake Mohave in the year 2012. There would be short- and long-term benefits from implementing alternative B.

Implementation of this alternative would not result in an impairment of the water quality resource.

VEGETATION INCLUDING SHORELINE VEGETATION

Impacts

No additional disturbance would be authorized over the existing level of development; therefore, no vegetation would be disturbed by development or construction activities. Continued use of the shoreline by recreationists could impact shoreline vegetation. The primary shoreline vegetation within the recreation area is nonnative tamarisk, and impacts on these species would be negligible since an overall NPS goal is to remove nonnative species where feasible.

Lake Mead and Lake Mohave do not have sensitive grasses and submerged aquatic vegetation near the shoreline areas, except in the sensitive inflow areas of the Colorado, Virgin, and Muddy Rivers. Native species, such as willow and cottonwood trees, do exist at certain shoreline areas, primarily around Lake Mohave and at the inflow areas. In addition, there are several rare plant species that are located under the high-water line or within walking distance of the lake. These species could be directly impacted by recreational use, such as from tree cutting for firewood or the trampling of small plants. These types of impacts would be considered minor to moderate, because under the worst-case scenario, they could cause a change in that plant community by altering the abundance, quantity, and quality over a localized area.

Impacts of Personal Watercraft Use

Personal watercraft users could access shoreline areas like other boaters and could create the same impacts as discussed above.

Cumulative Impacts

Overall cumulative impacts on rare and sensitive plant species would be the same as those described under alternative A.

Conclusion

Negligible to minor impacts on native vegetation could occur under this alternative with continued recreational use around the lakes. Nonnative species would be removed at selected high-use beaches to improve the recreational setting. If the recreational use of rare plant habitat increases, some rare plant species habitat could be lost and individual plants could be damaged. However, Lake Mead National Recreation Area would continue to preserve large portions of rare plant habitat in the area. There would be no impairment to vegetation or vegetative communities within the recreation area from the impacts resulting from this alternative.

WILDLIFE AND WILDLIFE HABITAT

Impacts

The impact on wildlife would be reduced compared with the other alternatives as development would be capped at the existing levels and specific areas would be zoned for nonmotorized use only. Impacts would be less than those described in the no-action alternative where facilities could be expanded to the limits described in the *General Management Plan* and where no zoning of sensitive areas would occur. Impacts would be less than those described under alternative D, where no zoning of sensitive areas would occur. Impacts would be comparable to alternative C, except that a larger percentage of the lakes would be zoned for nonmotorized use, including the Pearce Ferry to Iceberg Canyon portion of Lake Mead.

Personal watercraft and other watercraft noise may temporarily affect wildlife such as coyotes and bighorn sheep that visit the shoreline primarily for water. Wildlife, in general, move away from disturbances such as approaching motorized vessels. However, biologists from the National Park Service have observed unpredictable responses from bighorn sheep near the shoreline. At times, they will move away when a vessel is approaching and return when it moves away. Other times they will ignore the approaching vessel and not move. This indicates that any effects personal watercraft and other motorized watercraft have on bighorn sheep is minimal. Coyotes are very transient animals that have a high tolerance for human activity. Effects of personal watercraft or other motorized watercraft on coyotes are also expected to be minimal.

The elimination of motorized boating from the designated primitive areas on Lake Mead would decrease the disturbance to wildlife species, such as aquatic birds, that are located in these areas. Closure of these areas to motorized uses would reduce the impacts on area wildlife due to noise disturbance and human encroachment. Disturbances to aquatic bird populations from motor noise and watercraft operation in shallow zones would decrease after the closures. This alternative could provide beneficial impacts on wildlife and wildlife habitat in the closure areas due to the elimination of disturbance, noise, and the wake from motorized vessels.

On Lake Mohave, Black Canyon would be managed as a primitive recreational setting and motors would be prohibited in the canyon. This might promote increased bighorn sheep access to the river and minimize the influence of motorized recreation on sheep access to the shoreline.

The continued stocking of game species (rainbow trout) would continue at sites consistent with the recommendations of the Arizona Game and Fish Department and the Nevada Division of Wildlife. Should issues arise associated with the continuance of this program, a separate environmental analysis would be initiated in cooperation with other state and federal agencies. The impacts of continuing the site-specific stocking program would be negligible.

Additional shoreline fishing enhancement facilities might be added to the existing development areas. These would be in the form of fishing piers, dikes, docks, and underwater habitat enhancement structures. To the extent possible, only previously disturbed sites would be developed. These projects would involve work in the riparian zone and in the lake. This work could temporarily impact water quality and fish and aquatic resources through turbid runoff, siltation, and disruption of the substrate during construction activities. The use of check dams and silt curtains to confine siltation would partially mitigate some of this impact. Timing of construction would further decrease this impact. Since other habitat is available nearby and the developed zone would be in areas not considered critical for survival, this impact would be minor.

Impacts of Personal Watercraft Use

The restrictions placed on motorized vessels in sensitive areas would also apply to personal

watercraft. Eliminating personal watercraft from the sensitive inflow areas of the recreation area would benefit the wildlife located there, primarily birds and waterfowl. The restrictions would decrease the disturbance created by the noise and wake of personal watercraft and would reduce the emissions to the water and air from personal watercraft in these areas. However, none of these areas currently experience high levels of personal watercraft use compared with urban park and urban natural areas on Lakes Mead and Mohave. Ease of access is one of the primary reasons personal watercraft use in these areas is lower than elsewhere in the recreation area, as the inflow areas are generally located away from roads or developed marina facilities. Therefore, there could be some beneficial impacts on wildlife in these areas from restricting personal watercraft.

Cumulative Impacts

This alternative would protect wildlife from significant cumulative impacts within the recreation area. It further protects habitat in the sensitive inflow areas where aquatic and other bird species exist.

Conclusion

There would be no adverse impacts on wildlife under this alternative. Wildlife habitat in the sensitive inflow areas and in Black Canyon would be further protected from noise and disturbance from boats and personal watercraft with the primitive and semiprimitive zoning and watercraft restrictions in these areas. There would be beneficial impacts on wildlife from the restrictions placed on motorized use, on the establishment of shoreline [flat-wake](#) zones, and on the limitations placed on personal watercraft use. There would be no impairment to wildlife resources from the impacts resulting from this alternative.

THREATENED AND ENDANGERED SPECIES

Prior to undertaking any alternative, an assessment of the impacts on endangered, threatened, proposed, or candidate animal species would be conducted in consultation with the U.S. Fish and Wildlife Service, as necessary. Protection of these species would receive the highest consideration in project planning.

Impacts

No new construction or expansion of existing facilities is included in this alternative. Therefore, a finding of no effect on threatened or endangered species that exist near or utilize shoreline areas would occur as a result of construction activities.

Zoning that prohibits motorized vessels in sensitive areas and identified habitat for [Southwestern](#) willow flycatcher and other sensitive bird species might reduce impacts from motorized vessels, especially during critical nesting periods in June and July. Impacts would be eliminated, including large wakes that could destroy nests, noise, and human encroachment into nesting areas.

The 100-foot [flat-wake](#) zone around the shoreline of Lakes Mead and Mohave could reduce the potential impacts from noise and wake created by motorized vessels. This would protect the habitat in the shoreline areas. The restriction of motorized vessels in the Muddy and Virgin Rivers inflow areas, in the Pearce Ferry to Iceberg Canyon area, and in the Gypsum Beds area would further protect habitat and birds in those areas by eliminating noise and disturbance associated with motorized vessels. This alternative would protect the greatest amount of shoreline habitat from impacts associated with the use of motorized vessels.

As stated in the “Impacts of Alternative A” section, recreational activity has been shown to disturb bald eagles. Increased visitor use could potentially disturb these species. However, because areas used by the endangered bald eagle are high cliffs, well above the lakes, direct disturbance would not occur even if visitor use increases. In addition, bald eagles normally use these areas in the winter, a period when visitor use is low, and have not used the areas for nesting. Therefore, the anticipated increased visitor use during the summer would not likely adversely affect bald eagles. Sensitive peregrine falcons do nest in areas adjacent to Lakes Mead and Mohave, but these nesting sites are located on high cliffs and the additional proposed facilities under this alternative are not near known nesting locations. Therefore, increased visitor use during the summer would not likely adversely affect peregrine falcons. In addition, the horsepower restrictions and the temporal zoning of Black Canyon above Willow Beach would benefit peregrine falcons since it would reduce the noise created by motorized vessels.

Additional protection from nonmotorized use zoning would only occur in the sensitive inflow areas that are potential or known willow flycatcher habitat. Motorized use close to willow flycatcher habitat could disturb this species and cause them to abandon the area, as described in the “Impacts of Alternative A” section. Zoning to restrict motorized uses in the inflow areas of the Virgin and Muddy Rivers would protect potential willow flycatcher habitat at Lake Mead National Recreation Area. No further zoning would occur along Lake Mohave at potential willow flycatcher habitat. Although no confirmed nests have been found at the sites along Lake Mohave, willow flycatchers have been recorded during nesting season, and it is likely that nesting is occurring. While the overall impact of this alternative would be beneficial to the species, nesting pairs or individuals could likely be adversely affected by continued recreational use near potential nesting sites along Lake Mohave.

There would be no effect on the California brown pelican since it is a transient, infrequent visitor to the recreation area. The zoning would protect potential habitat for the Yuma clapper rail and the Western snowy plover. In comparison, the preferred alternative would not likely adversely affect these species.

The impacts of recreational use, including boating and personal watercraft use, on endangered razorback suckers and the endangered bonytail chub has not been thoroughly studied within the recreation area. Razorback suckers spawn from January through early April and occupy specific shoreline areas at this time. Endangered fish recovery efforts would continue for the razorback sucker by capturing the larvae in the spring and rearing them in grow-out ponds located along the shoreline of Lake Mohave. The National Park Service would continue to cooperate with state and federal agencies to use facilities within and outside of the recreation area for razorback sucker grow-out areas. It is likely they are more sensitive to disturbance during spawning. Biologists studying the razorback sucker for the past 10 years have noted that the use of motorized vessels in and around the razorback sucker spawning aggregations along the shorelines of Lake Mohave causes a great deal of turmoil (Marsh 2001). Passing watercraft interrupts spawning, displaces staging and spawning fish, disturbs substrates, and generally disturbs the fish, their behavior, and their habitat. This is especially a concern where fish are using the shallower shoreline areas where boat motors and their noises and turbulence are in close proximity to the fish. The

same type of disturbances would be likely for bonytail chub, which spawn from later in the spring into May.

The razorback sucker and the bonytail chub would benefit from the temporal zoning of their spawning areas that would prohibit motorized use in these areas during critical periods of their life cycles. They could also benefit from the establishment of the 100-foot [flat-wake](#) zone around the shoreline of the lakes. Plus, the spawning season for razorback suckers occurs during a period of low visitor use, and increased visitor use during the summer would not likely adversely affect razorback suckers. Increased visitor use during the shoulder seasons (spring and fall) at spawning areas could likely adversely affect razorback suckers by interrupting their spawning activities.

Bonytail chub are known to spawn during May. Though this is not during the peak visitor season, an increasing number of visitors are using the lakes. Impacts on this species from recreational use are unknown. This fish species would continue to be monitored to determine if recreational use creates adverse impacts. However, no management actions related to recreation management would be implemented under this alternative to provide additional protection to this species.

The elimination of carbureted two-stroke engines would serve to improve the aquatic habitat in high-use areas in the short-term and over the long-term. The expulsion of fuel unburned into the waters in razorback sucker and bonytail chub habitat could have detrimental impacts on the species by exposing them to gasoline and gasoline additives. While concentrations in Lake Mohave have not been recorded at levels that impair the health of the aquatic system, the long-term effects on the health of these endemic fish are not known. The amount of water in the lakes dilutes these chemicals and reduces any potential impacts on the aquatic habitat. With the additional restrictions on carbureted two-stroke engines, it would be likely there would be a beneficial impact on the overall aquatic ecosystem and on the endemic fish habitat.

[There would be no impacts to desert tortoises, as no facility expansion or new facilities would be authorized under this alternative.](#)

The relict leopard frog (*Rana onca*), while not a listed species under the *Endangered Species Act*, is a

species of concern at Lake Mead National Recreation Area. This frog was once thought to be extinct, but populations have been found at several springs within the recreation area in the past five years. Some of these springs are near the lake and are favorite destinations of water-based recreationists on Lake Mohave. Increased recreational use of these springs, particularly hiking to them and damming them, could adversely affect frog populations in these areas. However, since most of the critical areas for the frogs are located in areas with thick vegetation, visitors generally avoid these areas and impacts on frogs from recreational use have not occurred.

If monitoring of the relict leopard frog determines that recreational use impacts these species, the National Park Service would work with the [Rana Onca](#) Work Group to determine what actions would be necessary to provide further protection.

The stocking of game species is coordinated with the U.S. Fish and Wildlife Service, the Arizona Game and Fish Department, and the Nevada Division of Wildlife. Stocking sites could be expanded to include all development sites if and when fishing enhancements were developed. The National Park Service would coordinate with the fisheries management agencies to ensure the stocking of game species does not conflict with the management of the endangered native fish. Stocking of game species in particular coves in Lakes Mead and Mohave would not likely adversely affect endemic fish species.

Impacts of Personal Watercraft Use

Restricting the use of personal watercraft in selected areas around the lakes would have the same beneficial impacts on threatened and endangered species as restricting the use of other motorized vessels, as discussed above. The beneficial impact would primarily occur in Southwestern willow flycatcher habitat in the sensitive inflow areas. The [100-foot shoreline flat-wake](#) zone would also protect the habitat from high-speed vessels, disturbance from noise, and the creation of wake. Temporal zoning of spawning areas would include the prohibition of personal watercraft. The razorback sucker spawns between January and April, which is the low-use period for personal watercraft. The bonytail chub spawns into May, which is also a low-use period; however, use is increasing during this period. Therefore, there could be beneficial impacts from

restricting personal watercraft use in these areas during spawning time.

Cumulative Impacts

Lake Mead National Recreation Area preserves the important habitat of several species listed as threatened or endangered. While lands within the Las Vegas Valley are being lost to development, lands within the recreation area and other federal areas around Las Vegas are given funding through the multiple species habitat conservation planning process to help further protect these species. Although this action would not add to the total amount of land protected in the region, it would further protect the habitat within the recreation area. Known willow flycatcher habitat in the inflow areas would be protected from disturbance, and in the long-term, their populations in the park could increase, which could increase their overall population in the region. No other significant cumulative impacts would likely result from this alternative.

Conclusion

This alternative would not likely adversely affect any threatened and endangered species and could benefit certain species. Populations of willow flycatcher might benefit from the establishment of nonmotorized zones around inflow areas and the 100-foot flat-wake zone around the shoreline. Razorback suckers and bonytail chub might benefit from the temporal zoning of spawning areas. The water quality and health of the aquatic ecosystem would improve over the long-term with the ban on carbureted two-stroke marine engines, including personal watercraft. While continued recreational use during the spawning periods of bonytail chub and razorback suckers could temporarily disrupt spawning activities, this impact would not likely jeopardize the continued survival of these species. The 100-foot flat-wake zone should further protect these species.

Under the evaluation of section 7 of the *Endangered Species Act*, the determination has been made that this alternative would have no effect on the California brown pelican and would not likely adversely affect the bald eagle, peregrine falcon, desert tortoise, Yuma clapper rail, Western snowy plover, and willow flycatcher. Since the overall effect of this alternative would be beneficial by improving

aquatic habitat, but would also likely cause some adverse effects from continued recreational activities creating temporary disturbances during spawning activities, it has been determined that this action would likely adversely affect razorback suckers and bonytail chubs.

There would be no impairment to threatened or endangered species or species of concern from the impacts resulting from this alternative.

CULTURAL RESOURCES

Impacts

No new facility construction and no expansion of existing facilities would occur under this alternative. No impacts on cultural resources would occur. Cultural resources along the lakeshores would continue to be monitored. To ensure their protection, special zoning might be applied to limit recreation activities where sensitive resources were identified.

Impacts of Personal Watercraft Use

No impacts would occur on cultural resources from the continued use of personal watercraft in the recreation area.

Cumulative Impacts

No cumulative impacts on cultural resources from this alternative would be expected to occur.

Conclusion

No adverse impacts on cultural resources would occur. Further protection of cultural resources could be afforded to sites if zoning were applied to limit recreational activities. There would be no impairment to cultural resources from the impacts resulting from this alternative.

VISITOR USE, EXPERIENCE, AND SAFETY

Impacts

Under this alternative, there would be an emphasis on providing a wide range of recreational settings. Development would be capped and zoning would be used to further define recreational areas. Ten percent of the recreational opportunities would be classified as semiprimitive and primitive, the largest within any of the alternatives under consideration. Primitive and semiprimitive classifications would include the Virgin River Tributary, Pearce Ferry to Iceberg Canyon, including Grand Wash Bay and the Gypsum Beds area on Lake Mead, and Black Canyon above Willow Beach on Lake Mohave. Primitive areas would be restricted and only nonmotorized recreational use would be permitted. On Lake Mohave, north of Willow Beach, the launching of nonmotorized vessels at Hoover Dam would be increased from 30 to 80 boats per day.

This alternative would impact recreationists utilizing motorized vessels by reducing the amount of lake available to them. However, this impact would be minor considering only 11% of Lake Mead and 2% of Lake Mohave would be zoned in this manner, and 90% of both lakes combined would remain open to a variety of motorized uses.

The establishment of recreational settings, which would include prohibiting some motorized vessels, might improve the quality of the recreational experience for some user groups, such as kayakers and canoeists, in areas where motorized use is prohibited. The experience could be improved to these user groups by decreasing the noise levels, reducing visitor conflict and safety risks, and reducing the level of gasoline and gasoline additives in the water. Nonmotorized recreational users would be required to be more self-sufficient as they could no longer rely on assistance from the recreational users of motorized vessels in these areas.

Managing for zone carrying capacity would limit the number of boats on the lake at any one time. The impact of this would likely be realized only in developed areas on busy holiday weekends during the summer, such as at Katherine Landing and Callville Bay, where the areas are currently operating at or above capacities during the summer months, and in other developed areas in the future if the predicted use levels are reached. Parking is the primary tool

used to manage lake carrying capacity. As parking spaces are exhausted in specific areas, visitors would be directed to other lake access facilities where carrying capacity remains. This would limit the number of boats launched out of any given area and could limit the number of boats using the different zones on the lake, which would spread out the boating use on the lakes and could result in a less crowded, more safe, boating environment. This could result in an improved recreational experience for some users; however, some visitors would be disappointed if they were unable to use their selected area and were forced to recreate elsewhere or not at all. Marina users would be impacted if they had to wait for a parking space to gain access to their boats. There is the potential to mitigate this impact by enforcing the single parking spaces that restrict the parking of trailers in these lots. The facility capacities would be monitored for their effectiveness and could be altered over time if necessary.

This alternative would also impact recreationists who have carbureted two-stroke motorized vessels. These vessels would be prohibited from the recreation area with the adoption of this alternative. Apart from personal watercraft, carbureted two-stroke engines account for approximately 9% of all lake users in Nevada (State of Nevada 1999b). This figure varies by lake and season and on Lake Mead was shown to range between a low of 6% in the summer to a high of 31% in March, and on Lake Mohave, between a low of 9% in October to a high of 18.5% in March. According to the State of Nevada report, the primary activity during these high-use months was cruising/sailing. Fishing was also popular during these months, and it was more popular during the off-peak season (Graefe and Holland 1997).

When evaluating the impacts of this alternative, the number of registered vessels in Clark County was considered because a large portion of the recreation area visitors originate in Nevada, and most are probably from Clark County. In 1999 there were 34,589 registered vessels in Clark County, including nearly 11,000 personal watercraft. If an average of 9% are utilizing the newer model [direct-injection](#) two-stroke and four-stroke engines, there is the potential to impact more than 22,000 recreationists in Clark County. When considering the origin of recreationists includes California, Arizona, and Utah, the potential negative impacts on visitor experience from the ban on noncompliant or carbureted two-stroke engines would be major.

Black Canyon is a popular fishing area, and under this alternative boating access would be limited to paddlecraft. This would have major effects on motorized visitation to the area. It would reduce the area available to fisherman who rely on motorized vessels for transportation to fishing sites. Motorized recreational sightseeing by private parties would also be negatively impacted by this alternative. The concessions operation at Willow Beach would be negatively impacted by the reduction of motorized use in the area because the demand for fuel and boat rentals would decrease.

The concession-operated raft trips would continue in Black Canyon year-round. This would provide park visitors who are unable to use nonmotorized vessels an option for access into this area. The concession-operated raft trips have not been shown to impact nonmotorized users in visitor use surveys (Graefe and Holland 1997). In addition, these raft trips could serve as a point of contact between the National Park Service and nonmotorized users if there was an emergency situation.

This alternative could benefit nonmotorized recreationists, such as canoeists and kayakers. The alternative would allow for an increase in nonmotorized launches from below Hoover Dam. The quality of the recreational experience might be improved for nonmotorized users if the noise generated by motors, the wake, and also the hazards that might exist in areas where both activities take place were reduced. Nonmotorized users would be required to be more self-sufficient as they would no longer be able to depend on assistance from motorized users (other than the concession-operated raft trips and administrative patrols) if there were problems or emergency situations. Pretrip safety education and the existing requirements for personal flotation devices would reduce the potential for accidents. Overall, the effects would be beneficial to nonmotorized users.

Black Canyon is also a popular camping destination as there are three areas where hot springs flow into the Colorado River: Goldstrike Canyon, Arizona Hot Springs, and Boyscout Canyon. To reduce the impacts from camping in Black Canyon, a camping permit system is proposed that would include both paddlecraft users and hikers. Camping permits would be limited to 30 per day, based on two persons per permit. The canyons that access the springs are subject to flash flooding and camp sites need to be selected that are above the flood levels or are located

in an area independent of the drainage. Disseminating camping information, including warnings about flood hazards, would be an important part of the permitting system. Information about area hazards would educate visitors on how to have a safer trip and could decrease the number of rescues and visitor accidents in these areas. However, the permit system could negatively impact some visitors who are unable to obtain a permit and are forced to camp elsewhere.

Parking at each of the marinas and lake access points would be defined and a capacity would be set. The capacity would be based on the desired number of boats on the water at any one time to meet the zoning described above. Once the parking facilities reached the set capacity, the area would be identified as full, and additional visitors would need to use an alternative lake access location. Information identifying which facilities were at capacity would be available to visitors as they entered the park through an entrance station. This could create a major impact on the recreational experience of some visitors who may be turned away from their primary or favorite access point. However, there would be other areas available where opportunities would be available for recreational use.

Under this alternative, shoreline zoning would continue to be managed as a voluntary program in the Boulder Basin of Lake Mead and in the Katherine Landing area of Lake Mohave. Recommended recreational activities, including fishing, sailboarding, diving, waterskiing, and waterskiing an established slalom course, would occur in recommended areas. The specific areas are identified in figures 7 and 8. While voluntary zoning has resolved some of the conflicts between different user groups, it has not served to completely eliminate conflicts. Under this alternative, some conflicts might continue to adversely effect the recreational experience of some visitors. Visitors who are involved in conflicts could experience minor to moderate impacts on their recreational experience.

This alternative would require a [flat-wake](#) speed for boats within 100 feet of the shoreline and persons in the water. The 100-foot shoreline [flat-wake](#) zone would provide an adequate safety zone for recreational users along the shoreline and could serve to reduce visitor conflicts and improve safety. Motorized vessels would be required to slow to a [flat-wake](#) speed when approaching the shoreline. Grounding accounted for nearly 15% of all boat accidents in 1999 (State of Nevada 1999b). No

figures that categorize types of accidents are available for Lake Mead National Recreation Area, but it would be likely the grounding of vessels would be reduced under this alternative.

Alcohol use in the park would be prohibited within designated high-use areas and areas identified as focus areas by the patrol function. Current regulations regarding alcohol and boat operation would continue to apply. Alcohol is involved in many boating accidents and it is known by park rangers at Lake Mead National Recreation Area to be an underlying factor in conflict between user groups at the lake. The effects of alcohol are compounded by the extreme heat that can occur between May and October. Alcohol is currently prohibited in the Gypsum Wash area of the Boulder Basin, and this alternative would expand that prohibition where deemed necessary by the law enforcement staff. Prohibiting alcohol in specific areas of the park could lead to a safer recreational experience for visitors.

Inexperienced and uneducated boaters are one of the major causes of boating accidents. The majority of boat owners in Nevada (68%) have not taken a formal safety course; however, 64% of the boaters surveyed feel that more formal boating safety education is needed (State of Nevada 1999a). According to visitor use surveys conducted at the recreation area, 39% of users have had formal boating safety training at some point in their lives (Graefe and Holland 1997). Under this alternative, the National Park Service would begin to provide and coordinate instruction in boating safety. The National Park Service course would follow the National Association of Boating Law Administrators boating safety course outline and would satisfy all of its requirements as well as Nevada State mandatory boating education requirements. The impact of this program being offered at Lake Mead National Recreation Area is that the Nevada and the National Association of Boating Law Administrators requirements would be met and more boaters would be educated. The course would be offered near the water with visits to the docks to observe and experience first hand the safety equipment and its use. By reaching additional boaters with safety information, boating safety would likely improve and a reduction in boating accidents could occur within the recreation area.

The recreational setting of the lakeshore could also be improved with the requirement that all boaters must have a portable toilet. This would greatly reduce

the improper disposal of human waste and toilet tissue, which is problematic, especially with the fluctuating lake levels of both Lakes Mead and Mohave. To attain the goal of having a portable toilet at each campsite, there would first need to be a learning period, where patrols would talk with park visitors and educate them on the need for the sanitation program. There would also be portable toilets available for purchase and for rent at concession-operated facilities.

The recreational environment would be improved by restricting glass and styrofoam within the recreation area. Broken glass constitutes a majority of the litter along the lakeshore and roadways within the recreation area. Styrofoam debris is also a problem within the recreation area, primarily on the lakeshore. Restricting glass and styrofoam within the recreation area would improve the aesthetics of the area and improve the safety of the shoreline areas by reducing the potential for cuts and lacerations to recreational users from glass shards. However, some park visitors might rely on glass containers for a variety of products that may not be available in other containers; therefore, their experience might be negatively impacted. Public education would help lead to compliance with the policy and remind visitors to transfer their products to containers that are permitted in the recreation area.

Impacts of Personal Watercraft Use

Personal watercraft that comply with the EPA standards would continue to be authorized on the majority of Lakes Mead and Mohave. Users who do not have updated models would suffer displacement, resulting in major impacts since there are no other recreational lakes nearby in the region. Some people might not afford to purchase the newer [direct-injection](#) two-stroke and four-stroke models and would, therefore, not be able to recreate using personal watercraft on Lakes Mead and Mohave. The primary origins of lake users at the recreation area are from Nevada and California (41% each), Arizona (7%), and Utah (3%) (Graefe and Holland 1997). There were 11,000 registered personal watercraft owners in Clark County in 2000 (Nevada Division of Wildlife, F. Messman, pers. comm., Oct. 10, 2001). According to some studies, only a small percentage of these watercraft, between 5% and 11%, are [direct-injection](#) or have four-stroke operating systems. Therefore, this displacement would affect those personal watercraft users and rental operators who

could not afford to replace the carbureted two-stroke models.

In areas where personal watercraft use is restricted, other motorized uses are also restricted, including Black Canyon above Willow Beach on Lake Mohave, the inflow areas of Lake Mead (including the inflows of the Muddy and Virgin Rivers and Pearce Ferry to Iceberg Canyon) and the Gypsum Beds. None of these areas are considered high-use areas for personal watercraft; however, some personal watercraft users would be moderately impacted under this alternative by the reduction of areas available for their use. Other recreationists in these areas, including nonmotorized users, would experience beneficial effects from the elimination of motorized vessels, including personal watercraft. This would reduce the number of user conflicts in these areas and reduce the safety risk associated with the mixing of incompatible recreational activities.

The creation of a 100-foot flat-wake zone around the shoreline areas would reduce the conflicts between personal watercraft users and other recreationists, especially those around shoreline areas used for fishing or swimming. A flat-wake zone would also contribute to improved safety in the recreation area. Collisions with other vessels remains the most prevalent accident type; however, the grounding of motorized vessels, including personal watercraft, accounts for nearly 15% of all accident types in the state, and persons struck in the water by boats accounts for approximately 4% of accidents (State of Nevada 1999b). Therefore, instituting a 100-foot flat-wake zone around the shoreline and around those persons in the water could lead to decreased boating accidents on the lakes.

Cumulative Impacts

Boating education requirements could impact boating policy throughout the Southwest and could lead to safer waters throughout the region. As populations in the region continue to grow, facilities, including parking lots, could reach capacity, causing visitors to leave the area for other recreational areas, which could create overcrowding elsewhere. The restrictions on the use of carbureted two-stroke engines could lead to increased use in other areas around the region, including Lake Havasu and the Colorado River below Davis Dam. This could contribute to the safety problems at these areas.

Conclusion

Visitors who rely on motorized recreation, including personal watercraft users, could experience moderate to major impacts due to the displacement from their desired recreation location. This alternative would create major impacts on those persons who do not have EPA-compliant engines. They would have to purchase direct-injection two-stroke and four-stroke engines or be displaced from the recreation area.

Nonmotorized users could have an improved experience in areas where motors are prohibited due to less noise, less wake from vessels, and from hazards associated with motorized use. Nonmotorized users of Black Canyon would be required to be more self-reliant since motorized users, other than the concession-operated raft tours, would not be available to assist visitors.

Voluntary zoning could lead to visitor conflict if the recommended activities are not adhered to. Continued use of alcohol within the recreation area could lead to visitor conflicts. Boating safety should improve with the implementation of the education program and the shoreline flat-wake area. Requirements for portable toilets and restrictions on glass and styrofoam would improve sanitation around the lakeshore, and the quality of the recreational experience for visitors could improve.

SOUNDSCAPES

Impacts

Under this alternative all two-stroke carbureted engines would be banned one year after plan implementation (assumed to be 2004). Most visitors to Lakes Mead and Mohave have expectations of noise from motorized vessels during their visit. According to visitor use surveys, more than 60% of all visitors to the recreation area utilize motorized vessels as part of their experience (Graefe and Holland 1997). During peak use, personal watercraft account for approximately 30% of all boats on the water. Expectations of noise vary depending on the area on the lakes.

Under this alternative, no motorized vessels would be permitted in the inflow areas of the Virgin and Muddy Rivers, between Iceberg Canyon and Grand Canyon National Park, around the Gypsum Beds near Temple Bar, and at Grand Wash Bay. This would

allow for a more natural soundscape in these areas to serve nonmotorized recreationists and would protect the wildlife in these sensitive inflow areas from the impacts associated with noise from motorized vessels. In addition, the establishment of a shoreline 100-foot flat-wake zone could provide some protection to shoreline habitat and wildlife species occupying shoreline areas.

The closure of Black Canyon to motorized vessels would decrease the noise from motorized vessels in that area. Except for the occasional use of the canyon by the motorized raft tours, which would create temporary interruptions in the natural quiet as these rafts travel downstream, visitors to these areas during this time could expect a river environment virtually free from the noise of motorized vessels. The only boating noise would be the concession-operated raft trips (which are required to shut the engines off during portions of the trip and drift with the current). At the end of the day these rafts would be authorized to use motors to return the rafts to the docks at the base of Hoover Dam. As engines are replaced on the rafts, the National Park Service would require they be replaced with quiet, fuel-efficient models. The National Park Service may make a motorized patrol trip through the canyon near the end of the day to address safety issues. Other motorized boating traffic for administrative functions might be authorized in the canyon during these temporal closures.

Noise would continue to be a major part of the experience in the urban park and urban natural environment, as well as in the marina areas, because of the high use levels in these areas by motorized vessels. This would not change under this alternative; however, noise generated by carbureted two-stroke engines would be eliminated after 2004. The newer direct-injection two-stroke and four-stroke models are reported to be quieter than the older models (PWIA 2001).

Under this alternative, the National Park Service would comply with the state of Nevada boating noise regulation that limits noise to 75 A-weighted decibels when measured at the shoreline, independent of speed or distance; this should be easier to enforce than the previous standards. Because the new rules would be easier to enforce, it is anticipated that the noise issues would be addressed and the shoreline and boating environment improved on both Lakes Mead and Mohave.

There would be no noise created from construction activities since no construction would be authorized under this alternative.

Impacts of Personal Watercraft Use

Compliant models of personal watercraft would continue to be permitted in large portions of the recreation area. These models are said to be quieter than older models (PWIA 2001) and would comply with federal and state noise standards. The 100-foot flat-wake zone around the shoreline would decrease noise from personal watercraft operating at full throttle. Personal watercraft at full speed generate more noise than personal watercraft at idle or no-wake speeds. Plus, distance can reduce the intensity of sound generated from personal watercraft use to shoreline users, thus reducing the impact of noise from personal watercraft operating at high speeds outside the flat-wake zone. Most visitors to the lakes have some expectation of noise from watercraft, including personal watercraft. However, some visitors could continue to be negatively impacted by noise from personal watercraft due to the nature of the noise. Frequent changes in pitch and loudness caused by rapid acceleration, deceleration, and change of direction could remain noticeable to other recreationists.

In the areas zoned for nonmotorized use only, personal watercraft would also be restricted. This would result in several quiet areas around the lakes for visitors to enjoy without little or no noise from motorized vessels. The zoning would also protect wildlife, such as waterfowl, birds, and bighorn sheep, from potential impacts of noise, such as escape behavior and nest abandonment.

Cumulative Impacts

The cumulative impacts would be the same as those described under alternative A. In addition to the noise from motorized vessels, the soundscape in the upper Black Canyon is impacted by other outside noises, including air tours. As part of the development of the NPS *Internal Aircraft Management Plan* (NPS 1999b), park management will be working with the air tour industry to seek to preserve Black Canyon as a natural setting, which includes managing the area for natural quiet.

Conclusion

The inflow areas of the Virgin and Muddy Rivers, Pearce Ferry, and the Gypsum Bed areas would be designated for nonmotorized uses only. This would serve to protect the soundscape and natural quiet in these areas, which would be a beneficial impact on nonmotorized recreationists and the natural resources in those areas including wildlife. The northern portion of Black Canyon above Willow Beach would be zoned primitive to prohibit motorized uses year-round. This would allow for the natural sounds to be the primary sounds during those periods. This would serve to benefit nonmotorized recreationists during those periods as well as wildlife in the canyon. The continued operation of the commercial raft tours and administrative patrols during these periods would create a minor impact, as the noise from these rafts would only be heard occasionally and the primary sound would be the natural sounds.

Considering the enabling legislation, the history of motorized vessel use at Lake Mead National Recreation Area, and the park's goals and objectives to protect park resources and values, some noise from this source of recreational use is appropriate. The continued use of motorized vessels would continue to have a moderate impact on the soundscape. Stricter regulations that would be easier to enforce and the elimination of carbureted two-stroke engines would reduce the noise from these vessels.

The 100-foot [flat-wake](#) zone could also reduce the impacts of noise on people and wildlife on the shoreline. Overall, this alternative would better protect the natural soundscape in the remote, isolated and designated primitive areas of the recreation area by restricting the use of motorized vessels in these areas. No impairment to park resources would occur as a result of the impacts from this alternative.

SOCIOECONOMIC RESOURCES

Impacts

Under this alternative, there would be no increase in visitor services at the developed areas, and concessioner facilities would not be expanded. However, it would be likely the concessioner annual gross revenue, overall, would continue to increase at all facilities except Willow Beach, based on the continuing increase in park visitation and the trends in economic growth of the region. Concessioners

could benefit slightly from the sale of portable toilets. Since all glass and styrofoam would be restricted parkwide under this alternative, concessioners would not benefit from the sale of these items. According to annual financial reports for 1998 and 1999, combined grocery and packaged liquor sales varied between 4% and 10% of the total yearly gross, depending on the park concessioner. Records are not kept on the percentage of sales comprised of items in glass or styrofoam, but it is a portion of this percentage.

Services in communities adjacent to Lake Mead National Recreation Area would continue to benefit as visitors to the recreation area travel through these communities or use them as a base for their visits to the lakes.

The concession operation at Willow Beach might be negatively affected by the primitive designation of Black Canyon above Willow Beach and the designation of a semiprimitive zone below Willow Beach. The demand for fuel and boat rental services might decrease. While there would be an increase in paddlecraft at Willow Beach, these users would likely only use Willow Beach as a base for the launching and retrieval of their boats, which would add little to the Willow Beach concession revenues. There is the potential that the concessioners at Willow Beach could add to their income by renting paddlecraft.

Water-based recreation is a popular activity. The majority of the 8 to 10 million annual visitors at Lake Mead National Recreation Area engage in some form of water-based recreation. Of those, the National Park Service estimates that between 80,000 and 145,000 individuals used personal watercraft in the recreation area during 2001 (NPS 2002b). Therefore, while personal watercraft users will clearly be affected by restrictions on their use, they constitute a very small minority of all visitors to the recreation area.

The National Park Service estimates that the total personal watercraft-related revenue of all identified personal watercraft rental shops, dealerships, and businesses servicing personal watercraft in the Lake Mead National Recreation Area is approximately \$25 million (NPS 2002b). This figure is quite small compared with the size of the regional economy. In 1999, total personal income in Clark County, Nevada, was approximately \$27 billion. Thus, even if all personal watercraft revenues related to the park were to disappear, as the National Park Service predicts under the most severe scenario for this

alternative, the impact on the regional economy would be very small (<0.1% reduction in economic activity), although some businesses and communities in the county that rely heavily on personal watercraft users may experience localized impacts.

The National Park Service expects that revenues of lodging establishments, restaurants, and other tourism-related businesses in the region will be affected to some extent if personal watercraft use is restricted. However, the effects will likely be fairly small even under this alternative because a large portion of the personal watercraft users are local residents and expenditures by personal watercraft users from outside the region account for only a small portion of total tourism-related spending in Clark County.

In addition, it is possible that businesses relying on houseboat-related revenues could experience reductions in revenue if houseboat owners choose to go to other lakes because they can no longer use personal watercraft. However, based on interviews with local firms, the National Park Service does not anticipate a substantial reduction in visitation by houseboat owners. Most firms said there would be almost no impact on houseboat-related revenues. Overall, the National Park Service expects no measurable impact on the regional economy, although it is possible that some communities located near the recreation area may experience localized impacts (NPS 2002b).

Despite the fact that the National Park Service anticipates no measurable regional economic impact due to the personal watercraft regulations, it is very likely that personal watercraft dealerships, repair shops, and rental shops would see a decrease in revenue under this alternative. Thus, it is expected that personal watercraft users who are no longer willing or able to ride at Lake Mead National Recreation Area following the change in regulations may stop using personal watercraft altogether.

Concession-operated businesses and commercial businesses in the region would be impacted by the prohibition of carbureted two-stroke engines. Since these engines would be prohibited under this alternative, businesses no longer would profit from their sale or rental. This could detrimentally impact these businesses and create financial hardship as they convert to [direct-injection](#) two-stroke and four-stroke engines.

Impacts of Personal Watercraft Use

Businesses in the region would be impacted by the prohibition of carbureted two-stroke personal watercraft. As discussed above, the combined concessions rental fleet currently consists of 74 personal watercraft. The fleet would be replaced by the newer [direct-injection](#) two-stroke and four-stroke models. However, the immediate ban with the implementation of this plan would place a hardship on the concessioners as they would not be permitted to rent vessels unless [direct-injection](#) two-stroke and four-stroke models were purchased. In addition, area businesses that sell or rent older models would be negatively impacted as information became available about the ban of these personal watercraft at the recreation area. There are approximately 100 rental personal watercraft available from three businesses outside the park in the Henderson and Las Vegas area, and more are available in the Bullhead City area. Bullhead City does not rely solely on the waters of Lakes Mead or Mohave for their rental businesses; however, businesses in the Las Vegas area rely primarily on Lake Mead for their rental business.

According to one rental business, only 8 of 30 rentals are the 2006-compliant models (Get it Wet, J. Blackwell, pers. comm., Oct. 4, 2001). With a 100% rental rate during weekends between June and August, a 60% rental rate during weekdays in that same time frame, and \$125 to \$160 per day rental charges, not allowing the use of carbureted two-stroke personal watercraft could cost one rental company nearly \$250,000 in one summer, or nearly 75% of the personal watercraft portion of the rental business. This would be a major impact on the three area businesses that rent personal watercraft. This impact would occur until the time when current rental fleets are replaced by [direct-injection](#) two-stroke and four-stroke models.

Businesses selling or renting the new [direct-injection](#) two-stroke and four-stroke models could benefit from the prohibition of carbureted two-stroke personal watercraft because rentals and sales could increase.

The March 2002 Economic Analysis of Personal Watercraft Regulations in Lake Mead National Recreation Area (NPS 2002b) estimates that under alternative B, the economic impact would be approximately a 10% reduction in personal watercraft sales, service, and rentals related to the park.

The impact on the regional economy would be very small, less than a 0.1% reduction in total economic activity.

Cumulative Impacts

This alternative would not provide for an increase in visitor services in developed areas, but it would allow for slight increase in visitation based on regional growth. Better services and safer recreational opportunities within the park could cause increased visitation leading to increased pressure for more development inside and outside the recreation area. Increased visitation would lead to increased use of park facilities, and the condition of these facilities could deteriorate over time. If visitors consider conditions unacceptable, then in the future, there could be a decrease in park visitors, leading to a decrease in concession and local economy revenues. Considering the current condition of facilities and the likelihood that improvements of existing facilities would be authorized, a decrease in revenue would be unlikely.

Conclusion

Under this alternative, all concession-operated facilities within the park, except the Willow Beach concession operation, could benefit slightly from the predicted annual increase in visitation. However, no expansion would be allowed at any concession-operated facility under this alternative, creating a negative impact on the concessioners who had expectations of growth. Concession operations could be negatively impacted from restrictions on glass, styrofoam, and alcohol use and by the ban on carbureted two-stroke engines, though these would be temporary impacts. The economy of adjacent communities and the region could benefit from the expected annual growth in visitation to the recreation area. However, businesses that rent or sell older model carbureted two-stroke engines and personal watercraft would be negatively impacted by the restriction of their use in the recreation area. With the ban on two-stroke engines after 2004, 100% of the businesses related to the park that rent or sell carbureted two-stroke engines would be negatively impacted. In terms of personal watercraft the Personal Watercraft Industry Association has stated that the sales of the newer, more efficient models have already surpassed the sales of the carbureted

two-stroke personal watercraft (PWIA 2002). Businesses that sell or rent direct-injection two-stroke and four-stroke engines at the recreation area would benefit from the requirements under this alternative.

PARK OPERATIONS

Impacts

Impacts on the amount of law enforcement coverage required to implement this alternative would be the same as those described under alternative A. At least two additional law enforcement personnel and five to six more interpreters for each lake would be required to develop and implement a boating safety program. Four more interpretive staff, in addition to the basic requirements specified under alternative A, would be required to develop and implement an education program on the new lakeshore sanitation requirements. Three additional seasonal interpretive rangers would be required to provide education on water quality concerns related to offshore refueling activities in the recreation area. A 50% increase in maintenance staff would be necessary to maintain the existing facilities, and six more employees per lake would be necessary to install and maintain the increased numbers of backcountry toilets. Six more personnel, two boats, and a budget for supplies, equipment, and laboratory fees would be required during the summer months to implement the water monitoring program.

Cumulative Impacts

Without the necessary park staff, this alternative could not be implemented.

Conclusion

A total of 147 additional park staff would be required to effectively implement this alternative.

SUSTAINABILITY AND LONG-TERM MANAGEMENT

Actions proposed under alternative B would not result in any loss of long-term productivity, create irreversible or irretrievable commitments of resources, or result in any adverse impacts on park resources.

IMPACTS OF ALTERNATIVE C: MODIFIED PREFERRED ALTERNATIVE

Alternative C would provide for a range of recreational opportunities from primitive to urban park on both lakes. Facility expansion, including the construction of new or the improvement of existing launch ramps, the addition of slips in specific marinas, or the addition of boats in the rental fleet, could take place at several marinas. Marinas that could possibly expand include Cottonwood Cove on Lake Mohave, and on Lake Mead, Overton Beach, Temple Bar, Echo Bay, and Callville Bay. In addition, new lake access is proposed under this alternative at Eldorado Canyon on Lake Mohave, and new facilities are proposed at Stewarts Point on Lake Mead. This alternative would also include the construction of a loop road from Government Wash to Boxcar Cove and the paving of selected access roads and parking lots.

A major action under this alternative would be zoning the lakes to include primitive and semiprimitive recreational settings or zones. Approximately 5% of the waters of the lakes would be zoned primitive or semiprimitive, which would result in reduced boating levels and, in the case of the primitive settings, the elimination of motorized boating, except for electric trolling motors.

On Lake Mead, primitive zones would be established at the critical inflow area of the Virgin River and in the Gypsum Beds area. Semiprimitive zones with flat-wake restrictions would be established at the Muddy River inflow area (Overton Wildlife Management Area), Grand Wash Bay, and Bonelli Bay. The area above Paiute Point extending to the mouth of the Grand Canyon National Park would be managed for rural natural or semiprimitive, depending on whether Grand Canyon National Park will allow motorized boat traffic to enter the canyon from Lake Mead National Recreation Area.

On Lake Mohave, the primitive and semiprimitive areas would include Black Canyon above Willow Beach. In this area, temporal zoning would be applied, providing a range of recreational settings. The area would be managed for a primitive setting two days per week on a year-round basis. Between Labor Day and Memorial Day, the area would be managed for a semiprimitive setting five days per week, with a 65-horsepower limitation. During the summer months between Memorial Day and Labor Day, the area would be managed for a rural natural

setting with only houseboats, waterskiing, and wakeboarding prohibited. Personal watercraft use would be monitored during this period and restricted if the safety of lake users becomes an issue. This will be determined by reported conflict information and boating incidents and observations.

This alternative would allow for the continued use of two-stroke engines and personal watercraft until 2012, or 10 years after finalizing this plan, except in areas specifically zoned to prohibit all motorized vessels, as described above, and other regulated areas marked by buoys or signs.

The laws, regulations, policies, impact indicators, criteria, and methodology used to evaluate the impacts of this alternative are discussed in the first few sections of this chapter.

AIR QUALITY

Under this alternative, use of watercraft with carbureted two-stroke engines would be prohibited in the park in 2012 and subsequent years. There would be no restrictions on the number of personal watercraft or the type of engine used prior to 2012. For 2012 and subsequent years, it was assumed that the total use of the lakes by watercraft would be the same as if carbureted two-stroke engine watercraft had not been prohibited, and that the mix of watercraft types would not change. Carbureted two-stroke engines would be replaced by cleaner engines.

Human Health Impacts from Airborne Pollutants Related to Watercraft Use

Watercraft emissions of health-related pollutants were calculated for the years 2004 and 2012 according to the methods and assumptions described earlier in this chapter. Estimated emissions for alternative C are shown in table 51 (see the "Impacts of Alternative A" section of this chapter).

The Lake Mead National Recreation Area is an attainment area because the ambient air quality levels in the analysis area are within the national ambient air quality standards. Existing emissions are similar to those shown in table 51 for alternative D in 2004. The Lake Mead National Recreation Area would

continue to be in attainment under alternative C, as described below. No change in class II airshed status would result from this alternative, as existing personal watercraft and other watercraft activities have not resulted in the violation of any national ambient air quality standard. Alternative C would result in reduced emissions, as compared with the baseline (alternative D).

Under alternative C, hydrocarbon emissions would be 904 tons in 2004 and 360 tons in 2012, compared with alternative D (918 in 2004 and 659 in 2012). The reductions under alternative C would occur because carbureted two-stroke engines would be replaced with cleaner engines after 2012. This reduction would also result from a decrease in engine hours compared to alternative and from restrictions on personal watercraft or engine types. Under alternative C, the conversion to cleaner engines would result in HC emission reductions of 299 tons per year in 2012, compared with alternative D.

In 2012, an increase in NO_x emissions would occur under alternative C, because NO_x emissions of other engine types are greater than those of two-stroke carbureted engines. As described in the “Methodology” section under “Applicable Emission Standards” in this chapter, the sum of HC+NO_x emissions is the standard of the EPA rule. HC and NO_x are also the principal constituents of ozone. Under alternative C, there would be a net reduction in HC+NO_x emissions of 287 tons per year in 2012 when compared to alternative D, and a potential beneficial effect on regional ozone levels. The impact on human health from HC and NO_x would be minor in the long-term. This conclusion was based on the modeling results; the current ozone measurements, which are within the national standard; and the anticipated beneficial effect on regional ozone levels.

Under alternative C, conversion of carbureted two-stroke engines would result in CO emission reductions of 83 tons per year in 2004 and 30 tons per year in 2012, compared with alternative D. The impact to human health from CO emissions would be minor.

Total emissions of particulate matter (PM₁₀ and PM_{2.5}) would be reduced from 47 and 43 tons per year, respectively, under Alternative D to 35, and 32 tons under Alternative C by 2012. The impact on human health from particulate emissions would be negligible in the long-term.

In summary, compared to alternative D, long-term emissions of HC, CO, PM₁₀, and PM_{2.5} would decrease, while emissions of NO_x would increase in alternative C. The decreases in HC would be more than 20 times greater than the increases in NO_x, resulting in a reduction in the formation of ozone.

Impacts to Air Quality-Related Values from Watercraft Use

As described for the previous alternatives, the SUM06 index ranges from 16 to 32 ppm-hours, and ozone-induced injury to plants has not been detected in the region.

As described in the human health impact analysis, alternative C would result in a potential reduction of regional ozone formation. This would lead to a potential reduction in the SUM06 index.

Based on the lack of evidence of ozone injury to plants and the anticipated reductions in ozone formation, but recognizing the existing SUM06 index, the estimated level of long-term adverse impact on air quality-related values from alternative C would be moderate.

Particulate matter and NO_x emissions can degrade visibility. In the presence of sunlight, NO_x can contribute directly to haze. Under alternative C, PM_{2.5} emissions would be reduced by 1 ton in 2004 and 4 tons in 2012, compared to alternative D. The reduction in particulate emissions would tend to improve visibility, and the increase in NO_x emissions from watercraft activity in high-use areas would tend to degrade visibility during peak-use periods. The long-term adverse effects of these pollutants on visibility would be negligible.

Impacts of Personal Watercraft Use

Under this alternative, a very small reduction in the number of personal watercraft is forecast. However, after 2012, no personal watercraft powered by carbureted two-stroke engines would be permitted at Lake Mead National Recreation Area. Estimated emissions of personal watercraft are shown in table 51.

Compared to alternative D, by the year 2012, the engine conversions would eliminate personal watercraft emissions of 268 tons of hydrocarbons and 256 tons of HC+NO_x. Other pollutants would be eliminated as well (refer to table 51). The more efficient personal watercraft engines would reduce the amount of unburned fuel that escapes from the exhaust and would improve the local air quality in high-use coves during periods of concentrated use by reducing smoke and gasoline-type odors.

Impacts from Construction

Under this alternative, existing access roads would be improved and paved to reduce fugitive dust resulting from vehicle use. It would be likely under this and all alternatives that existing dirt parking areas would be paved. This would reduce local fugitive dust resulting from vehicle use and would benefit air quality in the area.

Construction projects proposed under this alternative would have short-term effects on air quality in the Colorado River watershed. There would be exhaust emissions from the heavy equipment used for the construction of

improved parking areas at marinas and launch ramps

new launch ramp and parking area at Stewarts Point

new launch ramp and parking area in the vicinity of Eldorado Canyon if a practical site is located

expanded marina facilities at Cottonwood Cove and Overton Beach

new beach access road from Box Car Cove to Government Wash

new shoreline campground at Government Wash

Construction activities would likely release moderate amounts of dust into the air. The construction of a beach access road from Box Car Cove to Government Wash could have a more noticeable effect on air quality due to the rock cuts and excavation needed to establish the road corridor.

Short-term construction emissions would be confined to the local working area by the use of dust-control

measures, such as applying water to roadway surfaces. To reduce air quality impacts of construction machinery, low-sulfur fuel (0.5% by weight) would be used, when available, and construction equipment would be properly tuned. These are the standard mitigation measures required by the National Park Service on all construction projects at Lake Mead National Recreation Area, and they also comply with requirements of the Clark County air quality standards. Conditions existing prior to construction could be expected to return once projects are completed. Impacts would be minor considering the temporary nature of the activities and the localized area in which the impacts would occur.

Lake Mead National Recreation Area complies with federal and state regulations related to the *Clean Air Act* and hazardous materials. Any facility renovation within Lake Mead National Recreation Area first requires a licensed contractor to test the building components to determine if there are asbestos and lead contaminants present. If contaminants are present, contractors would be hired to remove the contaminants in accordance with state and federal standards and requirements.

Cumulative Impacts

Both personal watercraft and other watercraft would contribute to the cumulative air quality impacts. As described for alternatives A and B, the occurrence of days with poor air quality within the recreation area could tend to increase as development and construction increases outside the park boundaries in the adjacent communities. Motorized vessel emissions, combined with emissions from outside the park, would result in a cumulative air quality impact. The current ambient air quality levels in the park area for all criteria pollutants would be expected to remain within national standards.

Based on emission forecasts within the park, SUM06 ozone levels would remain at their present levels or would improve. However, the SUM06 levels could be degraded by ozone-forming pollutants transported from outside the park.

Conclusion

Implementation of alternative C would eliminate carbureted two-stroke engines from the park after 2012. Prior to that time, there would be no notable

change in air quality, compared with baseline (alternative D). After 2012, cleaner engine types would replace the carbureted two-stroke engines, and there would be sizeable reductions in HC and HC+NO_x emissions. There would also be reductions in particulate (PM₁₀ and PM_{2.5}) and CO emissions. Compared to alternative D, by the year 2012, the conversion to cleaner engines required under alternative C would eliminate personal watercraft emissions of 268 tons of HC and 256 tons of HC+NO_x. Other pollutants would be eliminated as well. Criteria pollutant levels in the Lake Mead National Recreation Area would continue to be within national ambient air quality standards. No change in the class II airshed status would be expected.

Impacts to human health would be negligible for particulates and minor for HC, NO_x, and CO. Some beneficial impacts would occur after 2012 from the elimination of carbureted two-stroke engine watercraft emissions of HC, CO, NO_x, and particulate matter in the recreation area.

Impacts to air quality-related values would be moderate. PM_{2.5} reductions would contribute to an improvement in visibility, and the reduced ozone production would contribute to a reduced potential for plant damage. The impact is classified as moderate because of the existing SUM06 ozone index.

Implementation of this alternative would not result in an impairment of the air quality resource.

GEOLOGIC RESOURCES AND SOILS

Impacts

Actions are proposed that would result in the disturbance of shoreline areas. Some of these actions are addressed in the *General Management Plan* and under alternative A, including the expansion of the marinas at Cottonwood Cove, Callville Bay, and Temple Bar. The development of lake access facilities at Eldorado Canyon and Stewarts Point and the expansion of the marina at Overton Beach are not addressed in the *General Management Plan* but are included under this alternative.

Existing facilities in developed areas have consumed approximately 800 acres of desert soils. Additional development under this alternative could add to this,

though the total acreage would not be known until specific site plans were developed. The expansion sites at Overton Beach, Temple Bar, Callville Bay, and Cottonwood Cove would occur adjacent to the existing facilities, most likely in areas where previous soil disturbance has occurred. New development at Eldorado Canyon and Stewarts Point could occur on previously disturbed or undisturbed areas.

If previously disturbed areas are used for the expansion of existing developments or the construction of new developments, the impacts of these expansions on soils would be negligible. However, if expansion and development areas include land not previously disturbed, soils would be permanently damaged due to compaction, and this could cause an increase in soil erosion and runoff. Rehabilitation and landscaping would lessen the scars and prevent the loss of soil through erosion; however, the natural productivity of these soils would be lost. It would be expected that if all these disturbed areas were grouped together, they would constitute a moderate impact since the impacts would be localized and small in size, but would cause a permanent change in the soil structure in those particular areas.

The construction of a shoreline access road from Northshore Road would permanently impact soils from rock cuts, excavation, and other construction activities. This would be considered a moderate impact as it would create localized impacts on a small area, but would cause a permanent change in the soil structure where the paving of the road and the road cuts would occur.

Impacts of Personal Watercraft Use

There would be no impacts on the geologic resources and soils from personal watercraft use.

Cumulative Impacts

Desert soils in the surrounding communities are being impacted from construction activities and the associated growth in population; however, desert soils within the recreation area are protected. Illegal off-road vehicle use and construction activities create the major impacts on desert soils in the recreation area. Restoration activities on these sites are occurring on a broad scale, and preventative measures are being employed to minimize future

impacts. While there are currently construction activities taking place within the recreation area, for example, the construction of the Southern Nevada Water Authority waterline, it would be unlikely that the expansion of the Overton Beach, Callville Bay, Temple Bar, and Cottonwood Cove developed areas would result in significant, long-term cumulative impacts on soils because the expansion would occur adjacent to the existing sites, most likely in areas of previous disturbance. It would be unlikely that the construction of the additional developed areas at Stewarts Point and Eldorado Canyon would result in significant, long-term cumulative impacts on soils when considering the total amount of undisturbed soils within the recreation area.

Conclusion

Development that occurs in previously undisturbed sites could impact soil resources. Impacts that would result include soil compaction, which could lead to erosion and runoff. Revegetation and site design would help minimize these impacts. Overall, the combined impacts from the expansion of developed areas within the recreation area and the construction of new facilities or roads would create moderate impacts. Due to the size of the recreation area and the large amount of protected geologic resources and desert soils, no impairment to soils or geologic resources would occur from the impacts resulting from this alternative.

WATER RESOURCES

Impacts

Several actions have been proposed that might affect water quality, and others are proposed that might alleviate some impacts on water quality. Each item identified in the above air quality discussion might also affect water quality through runoff from construction sites into the waters of Lakes Mead or Mohave. The majority of the proposed construction activities would occur in areas that have been previously disturbed by recreational use or shoreline maintenance activities. Best management practices would be implemented to reduce potential impacts during construction from runoff and erosion.

The construction of fishing enhancement facilities would involve work in the riparian zone and in the lakes. This work could temporarily impact water quality, the fish, and aquatic resources through turbid

runoff, siltation, and the disruption of the substrate during construction activities. Best management practices, including the use of check dams and silt curtains to confine siltation, could partially mitigate some of this impact. Mitigation measures would be employed to ensure water quality and other habitat values are not adversely affected. These impacts would be detectable; however, they would be minor and well within or below water quality standards. The impacts would be considered minor because of the small portion of the lakes affected by the construction activities, the potential for mitigation, and the short-term nature of the construction activities.

Actions under this alternative would improve shoreline sanitation. Data from studies at Lake Mead National Recreation Area show that recreational camping on the shoreline, where facilities for human sanitation are not available, impacts shoreline water quality. Under this alternative, all parties camping on the lake or at the lakeshore would be required to use portable toilets. This measure, in the long-term, could have significant beneficial effects on maintaining the shoreline water quality and sanitation. Additional boat pumpouts and portable-toilet dump stations would be constructed, and all shoreline accessible areas would be supported by vault toilets. This would be a beneficial impact on water quality.

Components of the concession operations at the marinas, especially those associated with fueling and boat maintenance, could create minor to moderate impacts on water quality within the marina area. The National Park Service provides guidance on best management practices for the handling of fueling areas and boat maintenance for concessioners and the boating public. The purpose of these practices is to reduce the pollutants entering the lakes due to fueling and boat maintenance activities and to promote environmental awareness among the primarily urban user groups. With the management requirements and public education reducing the levels of these impacts, the impacts would be expected to be minor. However, an accidental spill could occur and create moderate to major impacts in the marinas.

Under this alternative, there is the potential that the offshore refueling of motorized vessels could continue to add gasoline and gasoline additives to the waters in high-use areas, reducing the water quality in these areas. Higher levels of enforcement of the regulations and increased education could help reduce this activity. This activity would create moderate impacts on water quality, as state water quality standards have been approached in busy

coves during high-use periods from May through September.

Prohibiting the use of motorized vessels in the proposed primitive areas of Lake Mead, which includes the sensitive inflow areas, would benefit the water quality in those areas. There would no longer be concerns about fuel deposits in these areas, and the water quality should improve. The limitations on horsepower and the temporal zoning in Black Canyon would result in negligible impacts. Motorized vessels would be able to use the canyon all summer and five out of seven days per week between Labor Day and Memorial Day weekend. In general, this area has consistently good water quality, well below state standards due to the continuous flushing that occurs there.

The ban of carbureted two-stroke engines in 2012 would eventually result in less fuel being deposited into the lakes from these engines. Water quality, particularly in high-use coves during the busy season, should improve when these restrictions are implemented. Up until that time, improvements in water quality should occur as carbureted two-stroke engines are replaced with the newer, cleaner-burning models. However, changing from carbureted two-stroke engines to two-stroke direct-injection engines may result in increases of airborne particulate-associated PAH. Further research is needed to identify what impact this would have on PAH concentration in water.

PAH stands for polycyclic aromatic hydrocarbons. PAH, comprised of benzo(a)pyrene, naphthalene, and 1-methyl naphthalene, are released during the combustion of fuel, though some PAH are also found in unburned gasoline. PAH, as well as other hydrocarbon emissions, could potentially be reduced as new four-stroke and direct-injection engines replace older carbureted two-stroke engines. The phase-out of carbureted two-stroke engines is an important step toward substantially reducing petroleum-related pollutants. Alternative C goes a step further in restricting the use of carbureted two-stroke engines after 2012.

The effects on drinking water would be the same as those described under alternative A.

Monitoring would continue as described under alternative A. To ensure the recreational setting of Lakes Mead and Mohave do not exceed state water quality and recreational water quality standards and to improve and maintain the highest levels of water

quality, a shoreline water quality monitoring program is proposed that would systematically sample and test recreational waters at preselected sites. The monitoring plan would include several targeted constituents of gasoline and related degradation products, including some PAH. The monitoring plan would focus efforts on high-use areas on Lakes Mead and Mohave. Specific locations might require temporal closures if monitoring identifies areas of concern not meeting water quality standards. The development of a monitoring plan would be consistent with the interests of local, state, and federal agencies.

Impacts of Personal Watercraft Use

Alternative C assumes that carbureted two-stroke personal watercraft would be replaced by newer direct-injection two-stroke and four-stroke engines after 2012.

The most visible benefits of this alternative would occur during the summer months and would be in the high-use coves, including Horsepower Cove, Saddle Cove, and Government Wash on Lake Mead, and Arizona and Nevada Telephone Coves and Cabinsite Point on Lake Mohave. A USGS sample found that gasoline compounds in the waters of selected coves during high-personal-watercraft-use periods were well within state standards.

Gasoline compounds have not been detected in water samples taken near the intake of the Southern Nevada Water System. Impacts on drinking water from the use of carbureted two-stroke engines would be eliminated after 2012 under this alternative.

Personal watercraft would contribute 3% of the hydrocarbon pollution in Lake Mead in 2004, and 19% in 2012. Under alternative D in the year 2004, personal watercraft would contribute 4% at Lake Mead and 44% in 2012.

Under alternative C for personal watercraft, maximum threshold volumes in 2004 required to meet standards would be approximately 108,000 acre-feet, or approximately 18% of the available mixing volume for Lake Mead. This is the maximum threshold required to meet the human health benchmark for benzene. In 2012, 16,500 acre-feet, or approximately 1% of the available mixing volume, would be required to meet the human benchmark for benzene.

Under alternative D for personal watercraft, maximum threshold volumes in 2004 required to meet standards would be approximately 123,000 acre-feet, or approximately 6% of the available mixing volume for Lake Mead. This is the maximum threshold required to meet the human health benchmark for benzene. In 2012, approximately 74,000 acre-feet, or 4% of the available mixing volume would be required to meet the human health benchmark for benzene (see appendix G, appendix H, and tables H-9 through H-12).

Under alternative C, personal watercraft would contribute 7% of the hydrocarbon pollution in Lake Mohave in 2004 and 63% in 2012. Under alternative D (baseline) personal watercraft would contribute 73% of the total hydrocarbon pollution in 2004 and 71% in 2012.

Under alternative C in 2004, the maximum threshold required to meet the human health benchmark for benzene in Lake Mohave would require a volume of approximately 120,000 acre-feet, or 17% of the available mixing volume, and approximately 32,000 acre-feet, or 5% of the available mixing volume in 2012.

Under alternative D in 2004, the maximum threshold required to meet the human health benchmark for benzene in Lake Mohave would require a volume of approximately 140,000 acre-feet, or 7% of the available mixing volume. In 2012, approximately 92,000 acre-feet, or 13% of the available mixing volume would be required.

Adverse impacts to water quality from personal watercraft use would be negligible to minor on both Lakes Mead and Mohave for the years 2004 and 2012. Effects would be long-term because they would recur annually during the summer heavy-use seasons. These effects to water quality could sometimes be detectable in confined areas such as coves with high watercraft use, but water quality standards or criteria would not be exceeded and would remain within historical or desired water quality conditions.

Impacts of Other Marine Engine Use

Effects from the use of all watercraft allowed under alternative C would include clean engine phasing of

carbureted two-stroke engines including personal watercraft from 2004 until 2012. After 2012 all carbureted two-stroke engines would be banned.

The combined effect of all engine types during 2004 on Lake Mead would require a threshold mixing volume of approximately 199,000 acre-feet, or 10% of the available mixing volume, to meet the human health benchmark for benzene. In 2012, a maximum threshold volume of approximately 86,000 acre-feet, or 4% of available mixing volume, would be required. Threshold volumes required to meet water quality standards at Lake Mead in 2012 under alternative C are 48% less than alternative D (baseline condition).

Results from year 2004 for Lake Mohave for all watercraft would require a maximum threshold mixing volume of approximately 165,000 acre-feet, or 24% of the available mixing volume, to meet the human health benchmark for benzene. In 2012, the human health benchmark for benzene would require a threshold volume of approximately 51,000 acre-feet, or 7% of the volume available for mixing. The adverse impacts would be considered negligible to minor. Threshold volumes required to meet water quality standards at Lake Mohave under alternative C are 61% less than alternative D.

Chemical pollutant monitoring would be instituted in order to protect the high water quality standards for recreation. If monitoring determines that water quality standards are being violated, specific areas in the recreation area could require temporal closures.

“Table 54: Impacts of All Watercraft on Surface Water Quality under Alternative C,” compares calculated threshold volumes of water and depth of water required to meet the specified water quality standards for this alternative.

In the summer, there are selected coves where personal watercraft use is concentrated, including Horsepower Cove, Saddle Cove, and Government Wash on Lake Mead, and Arizona and Nevada Telephone Coves and Cabinsite Point on Lake Mohave. In these areas, the concentrated use of personal watercraft can create minor impacts on a temporary basis. On a grab sample in June 1999, the U.S. Geological Survey found gasoline compounds in the waters of selected coves; however, they were well within the state standards (USGS 1999).

TABLE 54: IMPACTS OF ALL WATERCRAFT ON SURFACE WATER QUALITY UNDER ALTERNATIVE C

Threshold Volume or Depth of Water Needed to Meet Water Quality Standards									
Criteria	Constituent	Lake Mead 2004		Lake Mohave 2004		Lake Mead 2012		Lake Mohave 2012	
		Volume (af)	Depth (feet)	Volume (af)	Depth (feet)	Volume (af)	Depth (feet)	Volume (af)	Depth (feet)
Ecological Benchmarks	Benzo(a)pyrene	4,047	0.04	3,352	0.12	1,754	0.02	1,035	0.04
	Napthalene	1,602	0.01	1,326	0.05	694	0.01	410	0.01
	1-methyl Naphthalene	4,554	0.04	3,771	0.14	1,973	0.02	1,165	0.04
	Benzene	1,836	0.02	1,520	0.06	795	0.01	470	0.02
	MTBE	58	0.00	48	0.00	25	0.00	15	0.00
Arizona Standards for fish consumption	Benzo(a)pyrene	28,331	0.25	23,461	0.85	12,275	0.11	7,247	0.26
Human Health Criteria	Benzo(a)pyrene	12,878	0.11	10,664	0.39	5,580	0.05	3,294	0.12
	Benzene	198,900	1.76	164,706	6.00	86,179	0.76	50,877	1.85
Notes: af = acre-feet Lake Mead minimum pool – elevation 1,150 feet; total volume 16,440,000 af; volume above thermocline 2,085,000 af; surface area 112,890 square feet. Lake Mohave minimum pool – elevation 634 feet; volume 1,460,000 af; volume above thermocline 687,800 af; surface area 27,455 square feet.									

Impacts on Sensitive Aquatic Resources

Under this alternative, the most sensitive aquatic resources in the lakes, which are located at the sensitive inflow areas, would be protected with the ban on motorized vessels in these areas. However, Pearce Ferry would still be open to motorized vessels; therefore, the sensitive resources *that occur* there would still be exposed to the impacts from motorized uses, including the deposition of fuel and fuel compounds.

As under alternative B, compounds could still enter the lakes through runoff from parking facilities and construction zones, from fuel spills, and from Las Vegas Wash. Impacts on water quality could be detectable in these areas, and water quality standards could be temporarily exceeded, creating major impacts in these areas. These impacts would generally be temporary due to the large volume of water in the lakes and the volatile nature of these compounds. These impacts would primarily occur away from the sensitive inflow areas of the lakes, except at Las Vegas Wash, where different water quality standards apply. Concentrations of these

compounds would not result in impairment to the aquatic system.

Cumulative Impacts

Cumulative impacts in regard to protecting the inflow areas of Lake Mead are addressed under alternative A. Additional regulations in terms of sanitation, disposal of human waste, and regulating the use of carbureted two-stroke engines would offer further protection of the water resources of Lakes Mead and Mohave and would prevent the temporary or permanent closures of beaches and other high-use shoreline areas. Water quality in Las Vegas Wash continues to be a concern to park managers. The establishment of the Clark County Wetlands Park, as described under alternative A, would serve in the long-term to improve the water quality of Lake Mead proximate to the outflow of Las Vegas Wash.

Conclusion

Some minor, temporary, localized impacts on water quality could occur around construction sites. Under this alternative, water quality in high-use areas should improve in the long-term as portable toilet requirements are implemented, sanitation is improved, and carbureted two-stroke engine use is eliminated after 2012. Areas would continue to be monitored to ensure recreational standards for water quality are met.

The total boating capacity for both lakes under alternative C is 5,055 boats at any one time, compared to 5,800 boats at any one time under alternative D in 2004.

In 2004 at Lake Mead for all engine types, a maximum threshold volume of 199,000 acre-feet, or 10% of the available mixing volume would be required to meet water quality standards. This would be considered a negligible to minor adverse impact. The threshold volumes required to comply with water quality standards at Lake Mead under alternative C are 12% less than threshold volumes required for alternative D in the year 2004.

In 2012 at Lake Mead, when carbureted two-stroke engines would be eliminated, a maximum threshold volume of 86,000 acre-feet, or approximately 4% of the available mixing volume, would be required to meet the water quality standards. This would be considered a negligible to minor adverse impact. The threshold volumes required to meet water quality standards at Lake Mead under alternative C are 48% less than alternative D in 2012.

The maximum threshold volume of water required to meet water quality standards at Lake Mohave in 2004 for all engine types would be 165,000 acre-feet, or approximately 24% of the available mixing volume. This would be considered a negligible to minor adverse impact. The threshold volumes required to meet water quality standards at Lake Mohave in 2004 under alternative C are 15% less than threshold volumes required for alternative D.

In 2012 at Lake Mohave, a maximum threshold volume of 51,000 acre-feet, or approximately 7% of the available mixing volume, would be required to meet the water quality standards. This would be considered a negligible to minor adverse impact. The threshold volumes required to meet water quality standards at Lake Mohave under alternative C are

61% less than alternative D in 2012. Effects would be long-term because they would recur annually during the summer heavy-use season.

Implementation of this alternative would not result in an impairment of the water quality resource.

VEGETATION INCLUDING SHORELINE VEGETATION

Impacts

Vegetation may be damaged by the proposed expansion of existing facilities at Callville Bay, Temple Bar, Overton Beach, and Temple Bar and the development of new facilities at Eldorado Canyon and Stewarts Point. The impact on vegetation would be restricted to construction or expansion sites. The vegetative community most impacted by this preferred alternative would be the creosote-bursage community, which is the dominant plant community within the recreation area. Topsoil would be stockpiled at these sites and replaced where feasible until after construction, where it would be returned to the area for restoration purposes. Revegetation and landscaping with native species would occur within the areas; however, there would still be areas of native vegetation lost to development. Impacts would be localized, but would cause a change in the abundance of the native plant community; therefore, the impact would be moderate.

Lakes Mead and Mohave do not have sensitive grasses and submerged aquatic vegetation near the shoreline areas, except in the sensitive inflow areas of the Colorado, Virgin, and Muddy Rivers. The expanded semiprimitive and primitive zoning of the Muddy and Virgin River inflow areas would serve to protect aquatic vegetation. Native species, such as willows and cottonwoods, do exist at certain shoreline areas, primarily in the sensitive inflow areas of Lake Mead and around Lake Mohave where water levels fluctuate only 15 feet per year. In addition, there are several rare or sensitive plant species that are located under the high-water line or within walking distance of the lake. These species could be directly impacted by recreational use, such as tree cutting for firewood and the trampling of small plants. These types of impacts would be considered minor to moderate impacts. Under the worst-case scenario, they could cause a change in the plant community by altering the abundance, quantity, and quality over a localized area.

Some rare plants are known to occur along the shorelines of both Lakes Mead and Mohave. These populations have been documented and are monitored periodically. Under this alternative, these locations would continue to be monitored, and if additional protection were necessary, recreational use would be managed to provide greater protection to the habitat of these plants. No shoreline zoning would occur specifically for the purposes of protecting rare plants and their habitat at this time. There would be no additional level of protection to rare plant species that could be located under the high-water elevation, such as the sticky buckwheat, three-sided milkvetch, smoke tree, Las Vegas bearpoppy, sticky ringstem, and *Trixis californica* (no common name). Continued and increased visitor use in areas where these rare plants are located could damage the habitat by trampling and soil disturbance and decrease the number of plants in existence. However, since the majority of visitor use is concentrated along the shoreline, which is below the high-water line for both lakes, the amount of high-quality habitat in these areas is low compared with the amount above the high-water line.

As described in “Impacts of Alternative A,” fluctuating lake levels, especially on Lake Mead, can remove habitat by submersion or expose and create habitat as lake levels drop. The Bureau of Reclamation regulates lake levels, and large fluctuations can occur periodically; therefore, the National Park Service cannot mitigate impacts on potential or existing rare plant habitat that could occur below high-water elevations.

Potential habitat for the Las Vegas bearpoppy does exist around the proposed expansion site at Stewarts Point. However, the proposed development site would occur in previously disturbed areas, probably below the lake high-water line, and would likely have no impact on existing bearpoppy habitat. Surveys would be completed prior to construction, and plants would be avoided to ensure protection of this species. Impacts on rare plants under this alternative would be minor.

This alternative provides for shoreline enhancement of native riparian vegetation along Lake Mohave where fluctuating water levels are not as extreme as Lake Mead and where native willow and cottonwood trees could survive. Test areas have demonstrated these species can survive and can be used to reestablish the riparian vegetation zone along Lake Mohave. Specific locations would be determined, and

each site might require the mechanical removal of salt cedar to open the area for native species plantings.

Selected removal of salt cedar might occur at popular recreation sites to enhance the recreational setting. Salt cedar might also be removed from riparian communities surrounding springs in the vicinity of the lakeshore to improve wildlife habitat. Any removal of salt cedar would be accompanied by native species plantings. This would be a beneficial impact as it would replace nonnative salt cedar with native riparian vegetation.

Impacts of Personal Watercraft Use

Personal watercraft users can access shoreline areas like other boaters and can create the same impacts as described above.

Cumulative Impacts

Cumulative impacts on native plants are the same as those described in “Impacts of Alternative A.” In addition, damage to vegetation at the expansion and development sites would be on a localized basis and would not cause any significant, long-term cumulative impacts on the dominant vegetative community within the recreation area. Rare plant habitat would continue to be protected.

Conclusion

Some damage to vegetation would occur on a localized basis. Topsoil would be removed prior to construction and replaced afterwards, where feasible, to save the seed base and assist with restoration. Revegetation and landscaping with native vegetation would occur to replace vegetation. Under this alternative, no significant, long-term cumulative effects on the vegetative community would be expected. Nonnative salt cedar would be removed from selected shoreline areas and replaced with native cottonwood and willow trees, which could lead to some beneficial effects on the shoreline communities. Sensitive plant habitat would be monitored and additional levels of protection from recreational activities would be implemented if deemed necessary by park resource managers. There would be no impairment to native vegetation from the impacts resulting under this alternative.

WILDLIFE AND WILDLIFE HABITAT

Impacts

The construction projects at Stewarts Point and Eldorado Canyon and the expansion of developed areas at Callville Bay, Temple Bar, Overton Beach, and Cottonwood Cove would disturb wildlife on a short-term basis during construction and could result in long-term or permanent impacts due to the loss of habitat. The expansion and development areas would be located in areas previously disturbed by development or in areas where current development exists and the habitat is considered poor to marginal by biologists. Possible effects of construction noise and other activities would depend on the proximity to the construction sites, time of year, and species affected. Most animals would be expected to avoid these areas during construction and may abandon nests or dens if construction occurred during critical phases in their breeding cycles. In some instances, the permanent displacement of individuals could occur due to the loss of nest or den sites, roost sites, or protective cover or due to a decline in food sources. Since it is considered marginal habitat, not critical to survival, and additional habitat is located nearby, impacts associated with construction activities would be minor.

Impacts of construction near the lakeshore could also create runoff and increased silt and turbidity in aquatic habitats. For the most part, however, construction impacts would be short-term and minor. The timing of construction during the year and the day would do much to mitigate noise impacts. Impacts associated with habitat loss would not be expected to be significant due to the small acreage involved, the proximity to existing development (areas typically avoided by wildlife, particularly large mammals), the availability of undisturbed habitat nearby, and the restoration efforts that would occur after construction. Overall, impacts from construction activities would be minor due to these considerations.

Aquatic habitat and species would benefit in the inflow area of the Virgin River. In this highly productive and shallow area, the waters would be zoned to prohibit all motorized vessels, including motorboats and personal watercraft, [except vessels with electric trolling motors](#). Park staff have noted through field observations that bird species can be disturbed from the operation of motorized vessels. This is evident particularly in shallow areas and inflow regions where nesting sites could possibly be

disturbed. The primary disturbance noted is flying from nesting sites. It would be likely that prohibiting the use of all motorized vessels in these inflow areas would prevent the disturbance of important aquatic and nesting habitat. This would be a beneficial impact on nesting and migratory bird species.

[Impacts to wildlife would be reduced by establishing a semiprimitive zone in the Muddy River inflow area and allowing only flat-wake speed \(less than 5 mph\).](#)

[Personal watercraft and other watercraft noise may temporarily affect wildlife such as coyotes and bighorn sheep that visit the shoreline primarily for water. Wildlife, in general, move away from disturbances such as approaching motorized vessels. However, the National Park Service has observed unpredictable responses from bighorn sheep near the shoreline. At times, they will move away when a vessel is approaching and return when it moves away. Other times they will ignore the approaching vessel and not move. This indicates that any effects personal watercraft and other motorized watercraft have on bighorn sheep is minimal. Coyotes are very transient animals that have a high tolerance for human activity. Effects of personal watercraft or other motorized craft on coyotes are also expected to be minimal.](#)

The continued stocking of game species (rainbow trout) would continue at sites consistent with the recommendations of the Arizona Game and Fish Department and the Nevada Division of Wildlife. Should issues arise associated with the continuance of this program, a separate environmental analysis would be initiated in cooperation with other state and federal agencies. The impacts of the continued site-specific stocking program would be negligible.

Additional shoreline fishing enhancement facilities might be added to the existing development areas. These would be in the form of fishing piers, dikes, docks, and underwater structural enhancement projects. To the extent possible, only previously disturbed sites would be developed. These projects would involve work in the riparian zone and in the lake. This work could temporarily impact water quality and fish and aquatic resources through turbid runoff, siltation, and the disruption of the substrate during construction activities. The use of check dams and silt curtains to confine siltation would partially mitigate some of this impact. The strategic timing of construction would further decrease this impact. Since other habitat would be available nearby and the

developed zone would be in areas not considered critical for survival, this impact would be minor.

Impacts of Personal Watercraft Use

The restrictions placed on motorized vessels in sensitive areas would also apply to personal watercraft. The elimination of personal watercraft from the sensitive inflow areas of the recreation area would benefit the wildlife located there, primarily birds and waterfowl. The restrictions would decrease the disturbance created by the noise and wake of personal watercraft. It would reduce the emissions to the water and air from personal watercraft in these areas. However, none of these areas currently receive high levels of personal watercraft use compared with urban park and urban natural areas on Lakes Mead and Mohave. Ease of access is one of the primary reasons that use in these areas is lower than elsewhere in the recreation area, as the inflow areas are generally located away from roads or developed marina facilities. Therefore, some beneficial impacts on wildlife in these areas from restricting personal watercraft would be expected.

Cumulative Impacts

Proposed facility construction would result in the disturbance or loss of marginal wildlife habitat. The irretrievable commitment of this acreage to development would preclude its use as wildlife habitat. Based on the amount of available habitat adjacent to or near the construction sites, it would be unlikely that construction would have significant cumulative impacts on wildlife habitat in the recreation area [and in the region](#).

The added level of protection to the sensitive inflow areas of the Muddy and Virgin Rivers would ensure that wildlife species relying on these areas for habitat, such as bird species, would be protected, allowing for the perpetuation of species diversity within these areas of the recreation area. This would benefit bird species that use these areas on a broad scale, as these areas are considered extremely important for migratory birds.

Conclusion

Wildlife could be disturbed at the construction sites during the construction periods, and marginal wildlife

habitat would be removed. Based on the mitigation measures and the amount of undisturbed habitat adjacent to or nearby the development area, this impact would be minor. Construction projects along the lakeshore could temporarily impact aquatic habitat by increasing turbidity. This impact would be short-term and localized during construction activities and would be considered minor. This alternative would provide further protection to the sensitive inflow areas of Lake Mead from the potential disturbances resulting from motorized uses. This would be considered a beneficial impact. Implementation of this alternative would further the protection of wildlife habitat by reducing conflicts in critical nesting areas. The impacts of implementing this alternative would not impair park resources relative to wildlife.

THREATENED AND ENDANGERED SPECIES

Prior to undertaking any alternative, an assessment of its effects on endangered, threatened, proposed, or candidate animal species would be conducted in consultation with the U.S. Fish and Wildlife Service, as necessary. Protection of these species would receive highest consideration in project planning.

Impacts

[Desert tortoises have a patchy distribution at Lake Mead and throughout their range. Most of the park supports low densities of tortoises with a few hot spots of higher densities. Although monitoring plots and sign transects have helped identify areas of concern, it has not been possible to calculate accurate numeric densities for any area in the park. Methodologies for determining tortoise density have been debated for years and are still a major focus of discussion among biologists and land managers.](#)

[Developed areas, parking lots, and boat launch areas, whether at Cottonwood Cove, Eldorado Landing, Stewarts Point, or Overton Beach are located in marginal habitat with low tortoise densities, and management of these facilities poses little threat to the species. Access roads typically run through more suitable habitat, where the chance of tortoise impacts increases. Tortoise density is low near the access road to Stewarts Point. Tortoise densities near the access roads to Cottonwood Cove and Eldorado landing are low to medium but are particularly hard to quantify](#)

because drought-induced mortality has significantly reduced populations in those areas. The access road to Overton Beach poses the greatest concern. High tortoise densities have been found on a monitoring plot located near the intersection of the access road and Northshore Road, and tortoises are occasionally seen on the access road. Impacts to tortoises are considered in management of this area.

Vehicle-related mortalities associated with roads and illegal collection and harassment by people using the recreation area can adversely affect the desert tortoise. Area educational campaigns have probably helped to reduce this impact.

The expansion of existing facilities at Cottonwood Cove, Overton Beach, and Stewarts Point would occur near desert tortoise habitat. There have also been sightings of desert tortoise close to Callville Bay and Temple Bar. The site expansion at Cottonwood Cove, Overton Beach, Callville Bay, and Temple Bar would occur primarily in previously disturbed areas within the development zones and in poor-quality habitat below high-water elevations. Any development proposed outside previously disturbed areas would be surveyed prior to construction for desert tortoises and burrows. Park biologists would work with project and construction crews to avoid all potential impacts on desert tortoises. The National Park Service has worked with the U.S. Fish and Wildlife Service to develop mitigation to reduce or eliminate potential adverse impacts on desert tortoises from construction activities. In addition, the proposed development at Eldorado Canyon is located in a Desert Wildlife Management Area established to protect wildlife, such as the desert tortoise and its habitat. It may not be feasible to develop the site due to the proximity to critical desert tortoise habitat and the potential for flood hazards. As site-specific plans are developed, the National Park Service would work with the U.S. Fish and Wildlife Service to ensure the protection of the desert tortoise. Stewarts Point is also located near potential desert tortoise habitat. The same mitigation would apply to Stewarts Point, Callville Bay, and Temple Bar to protect desert tortoise habitat and ensure compliance with the *Endangered Species Act*.

As stated earlier in the “Impacts of Alternative A” section, recreational activity has been shown to disturb bald eagles. Increased visitor use could potentially disturb these species. However, because areas used by the endangered bald eagle are high cliffs, well above the lakes, direct disturbance would

not occur even if visitor use increases. In addition, bald eagles normally use these areas in the winter, during periods of low visitor use, and have not used the areas for nesting. Therefore, the anticipated increased visitor use during the summer would not likely adversely affect bald eagles. Sensitive peregrine falcons do nest in areas adjacent to Lakes Mead and Mohave, but these nesting sites are located on high cliffs and the additional proposed facilities under this alternative are not near known nesting locations. Therefore, increased visitor use during the summer would not likely adversely affect peregrine falcons. In addition, the horsepower restrictions and the temporal zoning of Black Canyon above Willow Beach would benefit peregrine falcons as it would reduce the noise created by motorized vessels.

Additional protection in the form of zoning for nonmotorized use and temporal closures would only occur in the sensitive inflow areas that are potential or known habitat for the Southwestern willow flycatcher. Motorized use close to willow flycatcher habitat could disturb this species and cause them to abandon the area, as described in the “Impacts of Alternative A” section. Primitive zoning to restrict motorized uses in the inflow areas of the Virgin River would protect known and potential willow flycatcher habitat at Lake Mead National Recreation Area. Although no confirmed nests have been found at the sites along Lake Mohave, willow flycatchers have been recorded during nesting season and it is likely that nesting is occurring. While the overall effect of this alternative is beneficial to the species, nesting pairs or individuals could likely be adversely affected by continued recreational use near potential nesting sites along Lake Mohave. Annual monitoring for Southwestern willow flycatcher would occur in an attempt to locate nesting pairs in suitable habitat within Lakes Mead and Mohave. Should nesting sites be found during these surveys, the areas would be closed to restrict all recreational use during the nesting season. Closures would occur via appropriate signage and barriers from the shoreline side and the use of buoys and markers from the lake-edge side.

There would be no effect on the California brown pelican since it is a transient, infrequent visitor to the recreation area. Yuma clapper rail and the Western snowy plover have not been found within the recreation area, though potential habitat exists. This modified preferred alternative would not likely adversely affect these species.

Endangered razorback suckers and endangered bonytail chub have been thoroughly studied within the recreation area, but these studies have not focused on the impacts from recreational use. These studies have focused on basic biology, genetics, and population as affected by the drastic change of the Colorado River system due to the construction of dams. The primary reasons for fish decline within the Colorado River system, as identified by biologists, is the alteration on the river system and the introduction of nonnative fish. Razorback suckers spawn from January through early April and occupy specific shoreline areas at this time. Endangered fish recovery efforts would continue for the razorback sucker with the capturing of larvae in the spring and rearing them in grow-out ponds located along the shoreline of Lake Mohave. The National Park Service would continue to cooperate with state and federal agencies to use facilities within and outside of the recreation area for razorback sucker grow-out areas. Razorback suckers spawn from January through early April and occupy specific shoreline areas at this time. It is likely they are more sensitive to disturbance during this period. Biologists studying the razorback sucker for the past 10 years have noted, through personal observation, that the use of motorized vessels in and around the razorback sucker spawning aggregations along the shorelines of Lake Mohave causes a great deal of turmoil (Marsh 2001). Passing watercraft interrupts spawning, displaces staging and spawning fish, disturbs substrates, and generally bothers the fish, their behavior, and their habitat. This is especially a concern where fish are using the shallower shoreline areas where boat motors and their noises and turbulence are in close proximity to the fish. The same type of disturbances would be likely for bonytail chub, which spawn later in the spring into May.

The spawning season for razorback suckers occurs during a period of low visitor use, and increased visitor use during the summer would not likely adversely affect razorback suckers. Increased visitor use during the shoulder seasons at spawning areas could likely adversely affect razorback suckers by interrupting their spawning activities.

Most known spawning areas of razorback suckers on Lakes Mead and Mohave would either be closed to all watercraft use during the spawning season, or the park would be prepared to close them based on a recommendation from the Native Fish Work Group. Only the mooring area of Echo Bay and the Las Vegas Bay marina would receive special exemptions during the razorback sucker spawning season. The

Echo Bay mooring area would remain open during the sucker spawning season, but it would be clearly marked from adjoining spawning areas via buoys and signage, and the marina would initiate a public awareness campaign. The Las Vegas Bay marina, which has been temporarily relocated, would remain open to motorized vessels during the spawning season; however, it will continue to be designated as a flat-wake zone. These restrictions and closures should prevent impacts to razorback sucker shallow spawning areas during the species' breeding season.

Bonytail chub are known to spawn during May, when increasing numbers of visitors are using the lakes. Impacts of recreational use to this species are unknown. Annual surveys would continue in an attempt to locate the species and its spawning areas and to determine if recreational use creates adverse impacts. Should bonytail chub spawning areas be found, and if monitoring determines that recreational use impacts these species, the National Park Service would work with the Native Fish Work Group to determine what actions, including temporal closures and wake restrictions, would be necessary to provide further protection.

The stocking of game species is coordinated with the U.S. Fish and Wildlife Service, the Arizona Game and Fish Department, and the Nevada Division of Wildlife. Stocking sites could be expanded to include all development sites if and when fishing enhancements are developed. The National Park Service would coordinate with the fisheries management agencies to ensure the stocking of games species would not conflict with the management of the endangered native fish. The stocking of game species in particular coves in Lakes Mead and Mohave would not likely adversely affect endemic fish species.

Construction of launch ramps at Eldorado Canyon and Stewarts Point could create turbidity in the waters adjacent to these sites, thus temporarily reducing the quality of the aquatic habitat on a short-term basis. Neither of these areas is a known spawning area for endangered fish species. Mitigation measures, such as silt curtains, would be used to decrease the amount of runoff and reduce turbidity. Construction would not likely adversely affect endemic fish species.

The reduced use of carbureted two-stroke engines until they are banned from the recreation area after 2012 could serve to improve the aquatic habitat in

high-use areas over the long-term. However, changing from carbureted two-stroke engines to two-stroke direct-injection engines may result in increases of airborne particulate-associated PAH (Kado et al. 2000). Further research is needed to identify what impact this would have on PAH concentrations in water. The expulsion of unburned fuel into the waters in razorback sucker and bonytail chub habitat could have detrimental impacts on the species by exposing them to gasoline, gasoline additives, and PAH combustion products. While concentrations in Lake Mohave have not been recorded at levels that impair the health of the aquatic system, the long-term effects on the health of these endemic fish is not known. It is likely that the short-lived nature of these chemicals and the amount of water in the lakes to dilute these chemicals would reduce any potential impacts on the aquatic habitat. With the further restrictions on carbureted two-stroke engines, it would be likely there would be a beneficial impact on the overall aquatic ecosystem and on endemic fish habitat.

The relict leopard frog (*Rana onca*), while not a listed species under the *Endangered Species Act*, is a species of concern at Lake Mead National Recreation Area. This frog was once thought to be extinct, but populations have been found at several springs within the recreation area in the past five years. Some of these springs are near the lake and are destinations for water-based recreationists on Lake Mohave. Increased recreational use of these springs, particularly hiking to them and damming them, could adversely affect frog populations in these areas. However, since most of the critical areas for the frogs are located in areas with thick vegetation, visitors generally avoid these areas, and impacts on frogs from recreational use have not occurred.

The National Park Service is currently working with the University of Nevada (Las Vegas and Reno), the Nevada Division of Wildlife, state of Arizona, U.S. Fish and Wildlife Service, and the Environmental Protection Agency to inventory and monitor the relict leopard frog. The Rana Onca Work Group, comprised of local, state, and federal land management, and wildlife agencies from Nevada, Arizona, and Utah, is also working on joint monitoring programs and a conservation strategy to protect the relict leopard frog. Conservation measures that are ongoing include reintroducing frogs into suitable habitat and working with area agencies to improve springs to conditions that support the relict leopard frogs, including nonnative plant removal.

Known relict leopard frog habitat along Black Canyon would not be designated as camping sites. If future monitoring shows an expansion of the relict leopard frogs into additional springs within the Black Canyon, those areas would be protected through temporal closures to camping and other protection measures, as necessary and appropriate.

Impacts of Personal Watercraft Use

Restricting the use of personal watercraft in selected areas around the lakes would have the same beneficial impacts on threatened and endangered species as restricting use of other motorized vessels as stated above. The beneficial impact would occur primarily in Southwestern willow flycatcher habitat in the sensitive inflow areas. Temporal zoning of spawning areas would include the prohibition of personal watercraft. The razorback sucker spawns between January and April, which is the low-use period for personal watercraft. Therefore, the beneficial impacts of restricting personal watercraft use in these areas during spawning time would be slight.

Cumulative Impacts

Cumulative impacts relate to the impoundment of the Colorado River and the preservation of important habitat in the region, as described in the "Impacts of Alternative A" section. Lake Mead National Recreation Area preserves important habitat of several species listed as threatened or endangered. While lands within the Las Vegas Valley are being lost to development, lands within the recreation area and other federal areas around Las Vegas are given funding through the multiple species habitat conservation planning process to help further protect these species. While this action would not add to the total amount of land protected in the region, it would further protect the habitat within the recreation area.

Known willow flycatcher habitat in the inflow areas would be protected from disturbance, and in the long-term, their populations in the park could increase, which could increase their overall population in the region. No other significant cumulative impacts would likely result from this alternative.

This alternative would ensure the protection of threatened and endangered species within Lake Mead National Recreation Area. No aspect of this

alternative would have a detrimental impact on the long-term survival of threatened and endangered species within the recreation area.

Conclusion

Through project planning and consultations with the U.S. Fish and Wildlife Service, the National Park Service would ensure that the actions under this [modified](#) preferred alternative would not result in a jeopardy finding to threatened and endangered species ([see appendix F for a listing of these species](#)). More protection to willow flycatcher populations in the sensitive inflow areas of Lake Mead would occur as a result of zoning for nonmotorized uses in these areas. The water quality and health of the aquatic ecosystem could improve over the long-term as the use of carbureted two-stroke engines was phased out. While continued recreational use during the spawning periods of bonytail chub and razorback suckers could temporarily disrupt spawning activities, this impact would not likely jeopardize the continued survival of these species.

Under the evaluation of section 7 of the *Endangered Species Act*, the determination has been made that this alternative would have no effect on the California brown pelican and would not likely adversely affect the bald eagle, peregrine falcon, Yuma clapper rail, Western snowy plover, and Southwestern willow flycatcher, since the overall effect of this alternative would be beneficial by improving aquatic habitat. Implementing this alternative would likely cause some adverse effects from continued recreational activities creating temporary disturbances during spawning activities; therefore, this action would likely adversely affect razorback suckers and bonytail chubs. [However, mitigation measures would be implemented to reduce impacts and protect spawning and nesting areas. Species in the most sensitive aquatic areas \(the inflow areas of the Virgin and Muddy Rivers\) would be protected by primitive and semiprimitive zoning.](#)

Construction activities that could occur in or around desert tortoise habitat could likely adversely affect desert tortoises; [however, mitigation measures would be in place prior to any construction activity, reducing potential adverse impacts to these species. There is the potential that low-density and/or marginal habitat could be lost as a result of this alternative. Alternative C would not likely jeopardize the continued existence of desert tortoise, nor destroy](#)

[or adversely modify its designated critical habitat. The implementation of alternative C is not expected to adversely affect the desert tortoise.](#)

There would be no impairment to threatened, endangered, or species of concern from the impacts resulting from this alternative.

CULTURAL RESOURCES

Impacts

To protect cultural resources and to comply with the *National Historic Preservation Act*, all proposed projects would be evaluated to determine the area of potential effect. These areas would be inventoried for significant cultural resources and a determination would be made as to what impact the project would have on the historic qualities of the resources. Through consultation with project designers, affiliate tribal entities, the respective State Historic Preservation Offices, and the Advisory Council on Historic Preservation, a plan would be developed to avoid or mitigate impacts.

Impacts of Personal Watercraft Use

There would be no impacts on cultural resources from the continued use of personal watercraft in the recreation area

Cumulative Impacts

No significant cumulative impacts on cultural resources would be anticipated.

Conclusion

Site design and coordination with the cultural resources manager would ensure that no cultural resources were damaged under this alternative. There would be no impairment to cultural resources from the impacts resulting from this alternative.

VISITOR USE, EXPERIENCE, AND SAFETY

Impacts

Actions proposed under this alternative are intended to enhance the protection of park resources, as well as visitor use and the enjoyment of recreational opportunities at Lake Mead National Recreation Area, while recognizing the highly scenic natural resource values. The lakes would be managed for a range of recreational opportunities. Five percent of the lakes would be included in the semiprimitive and primitive classifications. On Lake Mead, primitive areas would be located in the Gypsum Beds and Virgin River inflow area, and semiprimitive areas would be located in Grand Wash Bay, Muddy River inflow area (Overton Wildlife Management Area), and Bonelli Bay. The Black Canyon area of Lake Mohave, north of Willow Beach, would be designated primitive, semiprimitive, and rural natural depending on the time of the year and day of the week. Motorized uses would be restricted for two days of every week, year-round, except concession-operated raft trips and administrative patrols, which would be permitted every day.

Zoning for separate recreational opportunities might restrict portions of the lake for certain lake user groups, such as the restriction of motorized vessels in the inflow areas of Lake Mead and during selected periods in Black Canyon on Lake Mohave above Willow Beach. This alternative would impact recreationists utilizing motorized vessels by reducing the amount of lake available to them for water recreation. However, this impact would be minor considering only 5% of Lake Mead's and 2% of Lake Mohave's lake surface (represents 22% of the length of Lake Mohave) would be zoned with these restrictions, and 95% of both lakes would remain open to a variety of motorized uses.

The establishment of recreational settings, which includes some prohibition of motorized vessels, might improve the quality of the recreational experience for some user groups, such as kayakers and canoeists, in areas where motorized use is prohibited (except electric trolling motors) or zoned for flat-wake speeds (less than 5 mph). The experience could be improved to these user groups by decreasing the noise levels, reducing the visitor conflict and safety risks from concurrent use by motorized and nonmotorized user groups, and reducing the level of gasoline and gasoline additives

in the water resulting from the operation of carbureted two-stroke engines in those areas. Nonmotorized recreational users would be required to be more self-sufficient as they could no longer rely on assistance from the recreational users of motorized vessels in the primitive areas.

Managing for zone carrying capacity would limit the number of boats on the lake at any one time. The impact of this would likely be realized only in developed areas on busy holiday weekends during the summer, such as at Katherine Landing and Callville Bay where the areas are currently operating at or above capacities during the summer months and in other developed areas in the future if the predicted use levels are reached. Parking is the primary tool used to manage lake carrying capacity. As parking spaces are exhausted in specific areas, visitors would be directed to other lake access facilities where carrying capacity remains. This would limit the number of boats launched out of any given area and could limit the number of boats using the different zones on the lake. It would spread out the boating use on the lakes and could result in a less crowded, more safe boating environment, resulting in an improved recreational experience for some users. However, some visitors would be disappointed if they were unable to use their selected recreation area and were forced to recreate elsewhere, or not at all. Marina users would be impacted if they had to wait for a parking space to gain access to their boats. There is the potential to mitigate this impact by strictly enforcing the single parking spaces restricting the parking of trailers in these lots. The facility capacities would be monitored for their effectiveness and could be altered over time if necessary.

After 2012 this alternative would impact recreationists who have carbureted two-stroke motorized vessels. After 2012 only marine engines that meet the EPA 2006 requirements would be permitted in the recreation area. Currently, carbureted two-stroke engines account for approximately 9% of all lake users in Nevada (State of Nevada 1999b). This figure varies by lake and season and was shown to range on Lake Mead between a low of 6% in the summer to a high of 31% in March, and on Lake Mohave, between a low of 9% in October to a high of 18.5% in March. It is expected that as newer model engines replace older carbureted two-stroke engines, this figure would decrease. However, some carbureted two-stroke engines would still remain usable after 2012, and these recreationists would be negatively impacted by the ban.

The development of a parking lot and paved launch ramp at Stewarts Point has the potential to increase the level of visitation at that area and could negatively impact the cabin site leaseholders by increasing public visitation, the number of boaters, and vehicular traffic in that area. It could also benefit the lease holders by providing an adequate area to launch their watercraft. Reducing impacts on the lease holders would be considered in site planning and design.

Black Canyon is a popular fishing area, and under this alternative, [temporal zoning would be applied, providing a range of recreational settings. The area would be managed for a primitive setting two days per week on a year-round basis, and boating access would be limited to paddlecraft. Canoe launches would be increased in the semiprimitive and primitive zones to 45 and 60 launches per day, respectively. There would also be a 65-horsepower restriction imposed between Labor Day and Memorial Day weekends when the area would be managed for a semiprimitive setting five days per week.](#) This would have major effects on motorized visitation to the area [during this period](#). Horsepower restrictions would reduce the area available to fishermen who rely on motorized vessels for transportation to fishing sites [during these months](#). Motorized recreational sightseeing by private parties would also be negatively impacted by this alternative. The concession operation at Willow Beach would be negatively impacted by the reduction of motorized use in the area. The demand for fuel and boat rentals might decrease [during the winter months. During the summer months between Memorial Day and Labor Day, the area would be managed for a rural natural setting with only houseboats, wakeboarding, and waterskiing prohibited. Personal watercraft use would be monitored during this period and restricted if the safety of lake users becomes an issue. This would be determined by reported conflict information and boating incidents.](#) This alternative would have fewer significant impacts on users in this zone compared with the impacts on users under alternative B.

The concession-operated raft trips would continue in Black Canyon. This would provide park visitors who are unable to use nonmotorized vessels an option for access into this area. The concession-operated raft trips have not been shown to impact nonmotorized users in visitor use surveys (Graefe and Holland 1997). In addition, these raft trips could serve as a point of contact between the National Park Service

and nonmotorized users if there was an emergency situation.

Black Canyon is also a popular camping destination as there are three areas where hot springs flow into the Colorado River: Goldstrike Canyon, Arizona Hot Springs, and Boy Scout Canyon. To reduce the impacts of camping in Black Canyon, a camping permit system is proposed that would include motorized vessel users, paddlecraft users, and hikers. Permits would be limited to 30 per day, based on two persons per permit. The canyons that access the springs are subject to flash flooding, and camp sites need to be selected that are above the flood levels or are independent of the drainage. The dissemination of camping information (including flood hazards) would be an important part of the permitting system. This information about area hazards would educate and inform the visitor on how to have a safer trip and could decrease the number of rescues and visitor accidents in these areas. However, the permit system could negatively impact some visitors who are unable to obtain a permit and are forced to camp elsewhere.

Parking at each of the marinas and lake access points would be defined and a capacity set. The capacity would be based on the desired boats on the water at any one time to meet the zoning described above. Once the parking facilities were at the set capacity, the area would be identified as full and visitors would need to use an alternative lake access location. The information identifying which facilities were at capacity would be available to visitors as they entered the park through an entrance station. This could create a major impact on the recreational experience of some visitors who might be turned away from their primary or favorite access point. However, there would be other areas available where opportunities were available for recreational use.

Zoning for separate recreational uses in the urban interface areas would result in selected sites for specific recreational uses. As shown by existing voluntary zoning programs, this would serve to reduce conflicts between recreational users while improving the recreational experience for certain user groups. Zoning could also serve to improve the safety of recreational users in high-use areas because it restricts these areas to specific recreational activities.

Visitors who currently enjoy camping at Boxcar Cove, Crawdad Cove, [at the end of 8.0 Mile Road](#), Kingman Wash, and Eldorado Canyon would be negatively impacted as these areas would be

designated as day use only areas. However, improvements in these areas, such as shade shelters and backcountry bathrooms, could improve the recreational experience for other visitors. Since these areas are located in 100-year floodplains, visitors would actually be protected by the restrictions and a safer recreational environment would be established.

Under this alternative, [a 200-foot flat-wake zone around beaches frequented by bathers, boats at the shoreline, and near people in the water and at the water's edge would be required](#). This would increase the safety of boaters, swimmers, and recreationists at the water's edge.

Alcohol consumption while operating a boat would be prohibited under this alternative. Current restrictions on alcohol use would also apply. It is possible that restricting the alcohol use of boat operators would reduce the number of boating accidents and fatalities within the recreation area and would promote a safer recreational environment.

Inexperienced and uneducated boaters are one of the major causes of boating accidents. The majority of boat owners in Nevada (68%) have not taken a formal safety course; however, 64% of boaters feel that more formal boating safety education is needed (State of Nevada 1999b). According to visitor use surveys conducted at the recreation area, 39% of users have had formal boating safety training at some point in their lives (Graefe and Holland 1997). Under this alternative, the National Park Service would begin to provide and coordinate instruction on boating safety. The NPS course would follow the National Association of Boating Law Administrators boating safety course outline and would satisfy all of its requirements as well as the Nevada mandatory boating education requirements. The impact of offering this program at Lake Mead National Recreation Area is that Nevada and National Association of Boating Law Administrators requirements would be met and more boaters would be educated. The course would be offered near the water with visits to the docks to observe and experience first hand the safety equipment and its use. By reaching additional boaters with safety information, boating safety would likely improve and a reduction in boating accidents could occur within the recreation area.

This alternative identifies the need for uniform boating laws for boating activities on Lakes Mead and Mohave as a long-term objective. In the future, if

state and federal agencies work together to develop uniform boating laws, there would be less confusion on the regulations and requirements for boaters within Lake Mead National Recreation Area.

A parkwide program to address litter, if successful, would create a cleaner environment for recreational users and would likely improve the recreational experience for most visitors. Prohibiting glass beverage containers and styrofoam within the recreation area would reduce the amount of bottles, broken glass, and styrofoam along the lakeshore and roadways. Broken glass at high-use areas creates hazards to swimmers from cuts and lacerations. Reducing the risk would improve the recreational experience. Not allowing glass beverage containers could negatively impact the recreational user that prefers beverages available only in glass containers, and they would either have to transfer the beverage to an acceptable container or do without.

The implementation of a recycling program within the park could also reduce the amount of solid waste, such as cardboard, aluminum, and plastic, within the recreation area and would improve the recreational scene by reducing litter.

Shoreline sanitation could improve if the requirement for using portable toilets was implemented. Less human waste and related trash would exist on the shoreline areas, especially in the heavy-use areas. This would improve the recreational experience of visitors who use the shoreline resource. While the expense for the purchase of these portable toilets could create a hardship for lake users, there could be rental units available from park concessioners that would reduce the cost to visitors. Also, there are many options for purchasing these units within a reasonable range of costs.

[The discharge of black water into Lakes Mead and Mohave is currently prohibited. Black-water containment systems on vessels must be sealed to prevent discharge. Lake Mead National Recreation Area intends to seek funding for monitoring of pathogens and contaminants associated with both gray- and black-water releases. The National Park Service intends to work with the U.S. Geological Survey to further study the distribution and impact of contaminants associated with personal care products released in gray water. The National Park Service plans to work with the states of Nevada and Arizona for the development of consistent regulations across both states that protect the existing high water quality](#)

of both Lakes Mead and Mohave. If research and monitoring show that gray-water discharge from vessels becomes a threat to exceedance of water quality standards, regulations would be developed to prohibit the activity.

Impacts of Personal Watercraft Use

Personal watercraft use would continue to be authorized on the majority of Lakes Mead and Mohave, except in the [primitive and semiprimitive zones \(including Muddy and Virgin River inflows, Bonelli Bay, the Gypsum Beds, and Grand Wash on Lake Mead; and on Lake Mohave in Black Canyon above Willow Beach between Labor Day and Memorial Day weekends\)](#) and where prohibited elsewhere with buoys or signs. None of these areas are considered high-use areas for personal watercraft; however, some personal watercraft users would be moderately impacted under this alternative by the reduction of areas available for their use. Other recreationists in these areas, including nonmotorized users, would experience beneficial effects from the elimination of motorized vessels, including personal watercraft. It would reduce the number of user conflicts in these areas and reduce the safety risk associated with the mixing of incompatible recreational activities.

The [200-foot flat-wake restrictions](#) would reduce conflicts between personal watercraft users and other recreationists, especially those who are swimming or fishing. [Flat-wake restrictions](#) would contribute to improved safety in the recreation area. Collisions with other vessels remains the most prevalent accident type; however, the grounding of motorized vessels, including personal watercraft, accounts for nearly 15% of all accident types in the state, and persons struck in the water by boats accounts for approximately 4% of accidents (State of Nevada 1999b). Therefore, the [flat-wake restriction](#) could lead to decreased boating accidents on the lakes.

Cumulative Impacts

Lake Mead National Recreation Area is the premier recreation area in the Southwest. The primary users originate from California, Nevada, Arizona, and Utah. The implementation of this alternative would improve visitor satisfaction, crowding, circulation, displacement, safety, and conflict within Lake Mead National Recreation Area and could serve as a model

for other recreation areas in the region and in the nation. Mandatory boater education is likely to become a statewide program in Nevada and Arizona. This could improve boating safety throughout the region and throughout the country.

High-use areas and launch ramps would operate at capacity during peak use periods but within capacity on typical summer weekends. Launch lines at some sites would continue to exceed one hour only during these peak use periods. This could displace certain visitors who would need to seek recreational opportunities outside the recreation area. This could increase use and crowding at nearby sites, such as the Colorado River area south of Davis Dam.

Conclusion

In general, visitor experience should improve with the implementation of this alternative. Visitor conflicts should decrease due to recreational zoning and [implementation of the 200-foot flat-wake area around beaches frequented by bathers, boats at the shoreline, and near people in the water and at the water's edge](#). Visitor safety and experiences should improve because of carrying capacity limitations and mandatory boater education requirements. Sanitation and litter programs, alcohol restrictions for boat operators, and the long-term implementation of uniform boating laws would also contribute to improved visitor experiences. Some visitors might be adversely impacted by recreational opportunity restrictions, such as the policy to prohibit motorized use in primitive areas and the restrictions on motorized use [in semiprimitive areas](#). This alternative provides visitors with the opportunity to continue to use their carbureted two-stroke engine, including personal watercraft, until the year 2012.

SOUNDSCAPES

Impacts

[Under alternative C, carbureted two-stroke engines would be eliminated after 2012](#). Most visitors to Lakes Mead and Mohave have expectations of noise from motorized vessels. According to visitor use surveys, more than 60% of all visitors to the recreation area utilize motorized vessels as part of their experience (Graefe and Holland 1997). During peak use, personal watercraft account for approximately 30% of all boats on the water.

Expectations of noise vary with each visitor and their location on the lakes.

Although some engines are noisy at low speeds, noise level testing of typical personal watercraft and motorboats shows increasing noise with increasing speed. More importantly, the higher speed “playing” maneuvers of personal watercraft and smaller motorboats that cause higher noise levels would occur outside of the semiprimitive and primitive zones where flat-wake speeds must be maintained. Under alternative C, the width of the proposed flat-wake zone would be increased from 100 to 200 feet around beaches frequented by bathers, boats at the shoreline, and near people in the water and at the water’s edge. It is anticipated that this 100-foot increase would reduce noise to persons on the other side of the zone from 6 to 4 A-weighted decibels, as compared with the 100-foot zone originally proposed for this alternative C and that is currently proposed under alternative B.

Under this alternative, Lake Mead boating would be limited to nonmotorized vessels or electric trolling motors in the primitive zones (the Virgin River inflow area and Gypsum Beds), and in the semiprimitive zones (Grand Wash Bay, Bonelli Bay, and the Muddy River inflow area [Overton Wildlife Management Area]), boaters would be limited to flat-wake speed (less than 5 mph) or electric trolling motors. To serve nonmotorized recreationists in these areas, restrictions would allow for a more natural soundscape, and the sounds of nature should predominate over sounds created by human activities.

There would be times on Lake Mead when boating noise would be audible in the more restrictive zones, but there should be an improvement over the existing conditions where there are no boating restrictions.

Black Canyon at the upper end of Lake Mohave is one of the areas that would be affected by the new zoning. This area would be zoned as a primitive recreational setting for two days per week year-round and as a semiprimitive setting for five days per week between Labor Day and Memorial Day weekends. During the summer months between Memorial Day and Labor Day, the area would be managed for a rural natural setting with only houseboats, waterskiing, and wakeboarding prohibited. During the periods it is zoned for a primitive recreational setting, the only boating noise would be from the concession-operated raft trips (which are required to shut the engines off during portions of the trip and

drift with the current). At the end of the day, these rafts would be authorized to use motors to return the rafts to the docks at the base of Hoover Dam. As engines are replaced on the rafts, the National Park Service would require they be replaced with quiet, fuel-efficient models. The National Park Service may make a motorized patrol trip through the canyon near the end of the day to address safety issues. There would be no other motorized boating traffic authorized in the canyon during these temporal closures.

The establishment of primitive and semiprimitive zones would provide an opportunity for visitors to escape or greatly reduce their exposure to the sound of boats as part of their visit to Lakes Mead and Mohave. Some resource destinations on the lakes that occur in primitive or semiprimitive zones, including the hot springs and gypsum beds, would not be available to all recreational boaters. The vast majority of the lake surface would be available to all boaters. While these zones comprise about 5% of the water surface, there would be little impact on recreational boating overall.

Noise would continue to be a major part of the experience in the urban park and urban natural environment, as well as in the marina areas, because of the high-use levels in these areas by motorized vessels. This would not change under this alternative. In the long-term, after 2012, noise from carbureted two-stroke motorized vessels would be eliminated.

In addition to the noise from the use of motorized vessels, there would be noise created from the construction activities during the expansion of the developed areas. This noise would be temporary, would occur only during the operation of heavy equipment, would be localized within the existing development zones, and would be under 75 decibels and, therefore, would be considered a minor impact.

Impacts of Personal Watercraft Use

Personal watercraft would continue to be permitted in large portions of the recreation area. The state of Nevada noise regulation adopted under this alternative would prohibit the use of motorized vessels that operate at noise levels exceeding 75 A-weighted decibels measured at the shoreline, independent of speed or distance.

Most visitors to the lakes have some expectation of noise from watercraft, including personal watercraft. However, some visitors could continue to be negatively impacted by noise from personal watercraft due to the nature of the noise. Frequent changes in pitch and loudness caused by rapid acceleration, deceleration, and change of direction could remain noticeable to other recreationists.

After 2012, noise from carbureted two-stroke personal watercraft would be eliminated, as they would be prohibited from the recreation area. The [direct-injection](#) two-stroke and four-stroke models are reported to be quieter than older models (PWIA 2001) and would comply with federal and state noise standards.

In the areas zoned for [primitive and semiprimitive settings](#), personal watercraft would also be restricted. This would result in several quiet areas around the lakes for visitors to enjoy with little or no noise from motorized vessels. The zoning would also protect wildlife, such as waterfowl, birds, and bighorn sheep, from potential impacts of noise, such as escape behavior and nest abandonment.

Cumulative Impacts

The cumulative impacts of all boats under [alternative C](#) would be less than the baseline ([alternative D](#)), because [two-stroke engines are banned after 2012](#). In addition to the noise from motorized vessels, the soundscape in [the recreation area](#) is impacted by other outside noises, including air tours. As part of the development of the NPS *Aviation Management Plan* (NPS 1999b), park management would work with the air tour industry to seek to preserve Black Canyon as a natural setting, which would include managing the area for natural quiet.

Conclusion

[On Lake Mead, the inflow area of the Virgin River and the Gypsum Bed area would be designated as primitive, with nonmotorized uses and electric trolling motors only under this alternative.](#) This would serve to protect the soundscape and natural quiet in those areas, which would be a beneficial impact on nonmotorized recreationists and the natural resources in those areas including wildlife. [The semiprimitive areas would be located at the Muddy](#)

[River inflow area \(Overton Wildlife Management Area\), in Bonelli Bay, and Grand Wash Bay of Lake Mead.](#)

[On Lake Mohave, the northern portion of Black Canyon above Willow Beach would have temporal zoning that would prohibit motorized use two days per week year-round. This would allow for the natural sounds to be the primary sounds during those periods, and would serve to benefit nonmotorized recreationists, as well as wildlife species in the canyon. Between Labor Day and Memorial Day, the area would be managed for a semiprimitive setting five days per week, and during the summer months between Memorial Day and Labor Day, the area would be managed for a rural natural setting.](#)

The continued operation of the commercial raft tours and administrative patrols during those periods would create a minor impact, as the noise from these vessels would only be heard occasionally and the primary sound would be the natural sounds. Considering the enabling legislation, the history of motorized vessel use at Lake Mead National Recreation Area, and the park's goals and objectives to protect park resources and values, some noise from this source of recreational use is appropriate. The continued use of motors would continue to have a moderate impact on the soundscape. Stricter regulations that would be easier to enforce and the elimination of carbureted two-stroke engines would reduce noise. Impacts under [the modified alternative C](#) would not result in impairment to the park's soundscape.

The continued use of motorized vessels, including personal watercraft, would continue to create minor to moderate impacts on the soundscape in the high-use and development zones of Lakes Mead and Mohave. There would be beneficial impacts from eliminating motorized use in the primitive zones, and restricting motorized use [\(except electric trolling motors\)](#) in the semiprimitive zones. However, it is likely that visitors to these areas could experience minor to moderate impacts as noise travels from adjacent zones. [After 2012 there will be reduction in noise with the elimination of carbureted two-stroke engines.](#) While this alternative would protect more area than under alternatives A and D, it would protect less area than under alternative B. No impairment to park resources would occur as a result of the impacts from this alternative.

SOCIOECONOMIC RESOURCES

Impacts

Concession operations in the park gross a combined average of \$45 million per year. Specific concessioners where facility expansion is authorized would benefit financially because they would be able to offer additional services. Concessioners could benefit slightly from the sale or rental of portable toilets, but this would be an inconsequential amount compared with their overall profit. The concession operation at Willow Beach could be negatively impacted by the temporal semiprimitive designation of Black Canyon.

Since glass beverage containers and styrofoam would be restricted parkwide under this alternative, concessioners would not benefit from the sale of those items. According to the annual financial reports for 1998 and 1999, the combined sales for grocery and packaged liquor varied between 4% and 10% of the total yearly gross, depending on the park concessioner. Records are not kept on what percent of sales are comprised of items in glass beverage containers or styrofoam, but it is a portion of this percentage. The degree of impact of this alternative on concessioner revenue would be more than under alternative A, since alternative C would restrict the sale and possession of all glass beverage containers and styrofoam within the recreation area. *This adverse impact would be short-term, based on the availability of alternative containers.*

Improved visitor satisfaction could lead to an increase in repeat visitors to the recreation area. Services in communities adjacent to Lake Mead National Recreation Area would continue to benefit as visitors to the recreation area travel through these communities and/or use them as a base for their visits to the lakes.

The concession operation at Willow Beach might be negatively affected by the *semiprimitive* designation of Black Canyon above Willow Beach between *Labor Day and Memorial Day*. The demand for fuel and boat rental services might decrease *during this period*. While there would be an increase in paddlecraft at Willow Beach, these users would likely only use Willow Beach as a base for the launching and retrieval of their boats, and *this would* add little to the Willow Beach concession revenues.

Concession-operated businesses and commercial businesses in the region would have 10 years to gradually replace carbureted two-stroke engines with *direct-injection* two-stroke and four-stroke models. As the typical life span of a rental personal watercraft is 2 years, it would be likely *that* all models would be replaced within the 10-year period.

Impacts of Personal Watercraft Use

Area businesses and concessioners operating in the recreation area would have a 10-year time period to replace their rental fleet with *direct-injection* two-stroke and four-stroke models, thus reducing the socioeconomic impact the ban would have compared with the impact *under alternative B*. Businesses selling or renting the new, *direct-injection* two-stroke and four-stroke models would benefit as their sales and rentals could increase. However, with the knowledge of the imminent ban on carbureted two-stroke personal watercraft, businesses might be left with stocks of engines and watercraft they cannot sell.

The March 2002 Economic Analysis of Personal Watercraft Regulations in Lake Mead National Recreation Area (NPS 2002b) estimates that under alternative C, the economic impact would be approximately a 5% reduction in personal watercraft sales, services, and rentals related to the park.

The impact on the regional economy would be very small, less than a 0.1% reduction in total economic activity.

Cumulative Impacts

Better services and improved recreational opportunities within the park could cause increased visitation. Additional development outside the park in adjacent communities could result. Also, increased visitation could cause increased pressure for more development inside the park.

Conclusion

Prohibiting the sale of glass beverage containers and styrofoam within the recreation area, which could cause minor impacts from reduced income *until alternative containers are developed*. Concessioners (except the Willow Beach operation) should benefit

from this alternative due to increased park visitation and improved visitor facilities. Willow Beach could be negatively impacted by the temporal semiprimitive designation of Black Canyon and the reduction of motorized vessel use through the proposed restrictions. Concessioners located where expansion would be authorized would benefit from increased services and facilities. Adjacent communities could benefit from increased visitation to the recreation area.

The economy of adjacent communities and the region could benefit from the expected growth in visitation to the recreation area. However, businesses that rent or sell older model carbureted two-stroke engines and personal watercraft could be burdened with stock they could not sell after 2012. However, this alternative would have less impact compared with alternative B because of the 10-year timeframe allowed for conversion to the cleaner engines. Businesses that sell or rent direct-injection two-stroke and four-stroke engines would benefit from the new requirements at the recreation area.

PARK OPERATIONS

Impacts

To adequately implement this alternative, law enforcement coverage would have to increase as much as under alternative A, with an additional 10 law enforcement officers to regulate recreational zoning in urban interface areas and to patrol additional development areas within the recreation area. At least two additional law enforcement personnel and five to six more interpreters for each lake would be required to develop and implement a boating safety and education program. Four more interpretive personnel, in addition to the basic requirements specified under alternative A, would be required to develop and implement an education program on the new lakeshore sanitation requirements. Three additional seasonal interpretive rangers would be required to provide education on water quality concerns related to illegal refueling activities in the recreation area. A 50% increase in maintenance staff would be necessary to maintain the existing facilities, and six more per lake would be necessary to install and maintain the increased numbers of backcountry toilets. Six more personnel,

Impacts of Alternative C: Modified Preferred Alternative

two boats, and a budget for supplies, equipment, and laboratory fees would be necessary during the summer months to implement the water monitoring program.

Cumulative Impacts

Impacts would be the same as those described under alternative B.

Conclusion

Approximately 157 additional full-time or seasonal positions would be required to effectively implement this alternative.

SUSTAINABILITY AND LONG-TERM MANAGEMENT

Actions proposed under this alternative would not result in any significant loss of long-term productivity. The main actions that would cause direct impact on land resources relate to the proposed development of additional facilities at two locations within the recreation area and the expansion of several existing facilities. When evaluated on a broad scale, the amount of soils and vegetative resources that would be removed from the construction areas is limited and small in scale. Although site development and expansion would cause an irretrievable commitment of soils, vegetation, and wildlife habitat and these adverse impacts could not be avoided under this alternative, mitigation measures would serve to decrease the impacts, and the actions would not adversely affect the overall quality and productivity of the Mojave Desert ecosystem within the recreation area.

Sanitation requirements for portable toilets and the 2012 regulation preventing the operation of carbureted two-stroke engines could reduce potential impacts on water quality. The original riverine environment has been altered by the construction of the reservoirs and the invasion of exotic species such as tamarisk. Implementing this alternative would not amplify these impacts on the existing overall productivity of Lake Mead National Recreation Area.

IMPACTS OF ALTERNATIVE D: BASELINE

Alternative D emphasizes growth with a corresponding reduction in the variety of recreational activities available in the recreation area. Facility expansion would be similar to that proposed under alternative C. Facility expansion for Lake Mohave would occur at Cottonwood Cove, and a new launch facility would be constructed at Eldorado Canyon. On Lake Mead, expansion would be authorized at Overton Beach, Echo Bay, Temple Bar, and Callville Bay. A new launch facility would be constructed at Stewarts Point.

Under this alternative, a greater percentage of the waters of the recreation area would be designated as urban park and urban natural with no areas designated as primitive or semiprimitive. Areas would be managed for a high-density recreational experience for boaters and lake users. Lakeshore zoning would be mandatory and exclusive and certain areas would be closed to overnight camping.

This alternative would allow for the continued use of all two-stroke engines and personal watercraft in all zones of Lakes Mead and Mohave, except where they are specifically prohibited with buoys or signs.

AIR QUALITY

Under this alternative, there would be no park restrictions on the number of personal watercraft or the type of engine used in any watercraft. Therefore, as indicated in the “Methodology” section, alternative D is the baseline case for air quality impact analysis. For the calculation of emissions, it was assumed that carbureted two-stroke engines in personal watercraft and outboards would be replaced by cleaner engines at the rate projected by the Environmental Protection Agency in their forecast of the effects of the rule requiring the phase-out of carbureted two-stroke engines. Based on EPA data, it was assumed that 21.6% of carbureted two-stroke engines in use in 1998 would be replaced by 2004 and that 58.4% would be replaced by 2012.

Human Health Impacts from Airborne Pollutants Related to Watercraft Use

Watercraft emissions of health-related pollutants were calculated for the years 2004 and 2012 according to the methods and assumptions described earlier in this chapter. Estimated emissions for alternative D are shown in table 51 (see the “Impacts of Alternative A” section of this chapter).

The Lake Mead National Recreation Area is an attainment area because the ambient air quality levels in the analysis area are within the national ambient air quality standards. Existing emissions are similar to those shown in table 51 for alternative D in 2004. The Lake Mead National Recreation Area would continue to be in attainment under alternative D, as described below. No change in the class II airshed status would result from this alternative, as emissions from personal watercraft and other watercraft activities are within national ambient air quality standards.

Under alternative D, hydrocarbon (HC) emissions would be 659 tons in 2012. In the 2004 to 2012 period, the conversion to cleaner engines would result in HC emission reductions of approximately 259 tons per year. This reduction would continue in the years after 2012.

From 2004 through 2012, an increase in nitrogen oxides (NO_x) emissions would occur under alternative D because NO_x emissions of other engine types are greater than those of carbureted two-stroke engines. As described in the “Methodology” section under “Applicable Emission Standards” in this chapter, the sum of $\text{HC}+\text{NO}_x$ emissions is the standard of the EPA rule. Both HC and NO_x are ozone precursors in the presence of sunlight.

Under alternative D, there would be a net reduction in $\text{HC}+\text{NO}_x$ emissions of approximately 246 tons per year in 2012, compared to the emissions in 2004, and a potential beneficial effect on regional ozone levels. The impact on human health from HC and NO_x would be minor in the long-term. This conclusion was based on the modeling results, the current ozone measurements, which are within the national standard, and the anticipated beneficial effect on regional ozone levels. Under alternative D in 2004,

total emissions of particulate matter (PM₁₀ and PM_{2.5}) would be reduced from 50 and 46 tons per year in 2004 to 47 and 43 tons in 2012, respectively. The impact on human health from particulate emissions would be negligible in the long-term.

In summary, long-term emissions of HC, PM₁₀, and PM_{2.5} would decrease, while emissions of NO_x and CO would increase under alternative D. The decreases in HC would be more than 10 times greater than the increases in NO_x, resulting in a reduction in the formation of ozone.

Impacts to Air Quality–Related Values from Watercraft Pollutants

As described for the previous alternatives, the SUM06 index ranges from 16 to 32 ppm-hours, and ozone-induced injury to plants has not been detected in the region.

As described in the human health impact analysis, alternative D would result in a potential reduction of regional ozone formation. This would lead to a potential reduction in the SUM06 index.

Based on the lack of evidence of ozone injury to plants and the anticipated reductions in ozone formation, but recognizing the existing SUM06 index, the estimated level of long-term adverse impact on air quality-related values from alternative D would be moderate.

With implementation of alternative D, particulate matter emissions would be less than 50 tons per year. As described above, NO_x emissions would increase because the low-emission engines produce more NO_x emissions than do carbureted two-stroke engines. The reduction in particulate emissions would tend to improve visibility, and the increase in NO_x emissions from watercraft activity in high-use areas would tend to degrade visibility during peak-use periods. The long-term adverse effects of these pollutants on visibility, as a result of implementation of alternative D would be negligible.

Impacts of Personal Watercraft Use

Under this alternative, no reduction in the number of personal watercraft is forecast. There would be a continuing reduction of personal watercraft powered by carbureted two-stroke engines. Estimated

emissions of personal watercraft are shown in table 51.

Comparing the years 2004 to 2012, the engine conversions would eliminate personal watercraft emissions of approximately 234 tons of hydrocarbons and 222 tons of HC+NO_x. Other pollutants would be eliminated as well (see table 51). The more efficient personal watercraft engines would reduce the amount of unburned fuel that escapes from the exhaust and would improve the local air quality in high-use coves during periods of concentrated use by reducing smoke and gasoline-type odors.

Impacts from Construction

Construction projects proposed under this alternative would have short-term effects on air quality in the Colorado River watershed. There would be exhaust emissions from heavy equipment used for the proposed construction of

- improved parking areas at marinas and launch ramps

- new launch ramp and parking area at Stewarts Point

- new launch ramp and parking area in the vicinity of Eldorado Canyon if practical site is located

- expanded marina facilities at Cottonwood Cove and Overton Beach

Construction activities would likely release moderate amounts of dust into the air. Short-term construction emissions would be confined to the local area by the use of dust-control measures, such as applying water to roadway surfaces. To reduce air quality impacts of construction machinery, low-sulfur fuel (0.05% by weight) would be used, when available, and construction equipment would be properly tuned. These are the standard mitigation measures required by the National Park Service at Lake Mead Recreation Area, and they also comply with requirements of the Clark County air quality standards. Conditions existing prior to construction could be expected to return once projects were completed.

Lake Mead National Recreation Area complies with federal and state regulations related to the *Clean Air Act* and hazardous materials. Any facility renovation

within Lake Mead National Recreation Area first requires a licensed contractor to test the building components to determine if there are asbestos and lead contaminants present. If contaminants are present, contractors are hired to remove the contaminants in accordance with state and federal standards and requirements.

Cumulative Impacts

Both personal watercraft and other watercraft would contribute to the cumulative air quality impacts. There would be no prohibition of personal watercraft or carbureted two-stroke engines, and no temporary decrease in visitor use would be anticipated.

As described for prior alternatives, the occurrence of days with poor air quality within the recreation area could tend to increase as development and construction increases outside the park boundaries in the adjacent communities. Motorized vessel emissions, combined with emissions from outside the park, would result in a cumulative air quality impacts. The current ambient air quality levels in the park area for all criteria pollutants would be expected to remain within national standards.

Based on emission forecasts within the park, SUM06 ozone levels would remain at their present levels or would improve. However, the SUM06 levels could be degraded by ozone-forming pollutants transported from outside the park.

Conclusion

Implementation of alternative D would impose no restrictions on the type of watercraft or engine used in the park. There would be a continuing reduction in carbureted two-stroke engines as a result of EPA regulations. The replacement engines would be more efficient, and there would be sizeable reductions in HC and HC+NO_x emissions. There would also be reductions in PM₁₀ and PM_{2.5} emissions. CO and NO_x emissions would increase slightly.

Criteria pollutant levels in the Lake Mead National Recreation Area would be within national ambient air quality standards. No change in the class II airshed status would be expected.

Impacts to human health would be negligible for particulates and moderate for HC, NO_x, and CO.

The long-term impacts to human health would be negligible for particulates and moderate for HC, CO, and NO_x. Some benefits would occur from the elimination of carbureted two-stroke engine watercraft emissions of HC, CO, NO_x, and particulate matter in the recreation area.

Impacts to air quality-related values would be moderate. Minor PM_{2.5} reductions would contribute to an improvement in visibility, and the reduced ozone production would contribute to a reduced potential for plant damage. The impact is classified as moderate because of the existing SUM06 ozone index.

Implementation of this alternative would not result in an impairment of the air quality resource.

GEOLOGIC RESOURCES AND SOILS

Impacts

The disturbance to geologic resources and soils under this alternative would be similar to those described under alternative C. For the most part, any construction or expansion of existing facilities would occur on previously disturbed areas, and therefore, the impacts would be minor. However, if expansion and development zones include areas not previously disturbed, soils would be permanently damaged due to compaction, which could cause an increase in soil erosion and runoff. Rehabilitation and landscaping would lessen the scars and prevent the loss of soil through erosion; however, the natural productivity of these soils would be lost.

Impacts of Personal Watercraft Use

There would be no impacts on the geologic resources and soils from personal watercraft use.

Cumulative Impacts

Impacts would be the same as those described under alternative C.

Conclusion

Development that occurs in previously undisturbed sites could impact soil resources. Impacts would

include soil compaction, which could lead to erosion and runoff. Revegetation and site design would help minimize these impacts. Overall, the impacts from the expansion of developed areas within the recreation area or the construction of new facilities or roads would, when combined, create moderate impacts. Due to the size of the recreation area and the large amount of protected geologic resources and desert soils, no impairment to soils or geologic resources would occur from the impacts resulting from this alternative.

WATER RESOURCES

Impacts

Several actions have been proposed that might affect water quality and others are proposed that might alleviate some impacts on water quality. Each of the items identified in the above air quality discussion might also affect water quality through runoff from construction sites into the waters of Lakes Mead or Mohave.

Potential impacts on water quality could occur as a result of the construction activities, human use and waste disposal, concession operations, offshore refueling, use of motorized vessels, and the continued use of carbureted two-stroke engines.

Construction activities in the developed areas of Overton Beach, Temple Bar, Callville Bay, Echo Bay, and Cottonwood Cove and the new construction of facilities at Eldorado Canyon and Stewarts Point could create runoff of contaminants from construction equipment, including oil, and increased erosion. The paving of selected parking lots could lead to increased stormwater runoff, which could add more gasoline components into the lakes. The use of best management practices, including site design and the placement of berms and drainage systems, could reduce runoff and erosion. Because these impacts would occur in small, localized areas only during the construction period and mitigation measures could reduce these impacts, the impacts would be considered minor.

The construction of fishing enhancement facilities would involve work in the riparian zone and in the lake. This work could temporarily impact water quality and fish and aquatic resources through turbid runoff, siltation, and the disruption of the substrate during construction activities. Best management

practices, including the use of check dams and silt curtains to confine siltation, could partially mitigate some of this impact. Mitigation measures would be employed to ensure water quality and other habitat values would not be adversely affected. These impacts would be minor as the effects would be detectable; however, they would be well within water quality standards. Plus, the impacts would be minor because of the small portion of the lakes affected by the construction activities, the potential for mitigation, and the short-term nature of the construction activities.

This alternative could potentially improve shoreline sanitation. Data show that recreational camping on the shoreline, where facilities for human sanitation are not available, can impact shoreline water quality. Portable toilets would be required for all boaters. This measure, in the long-term, could have significant effects on maintaining the shoreline water quality. Additional boat pump-outs and portable-toilet dump stations would be constructed, and all shoreline accessible areas would be supported by vault toilets. The portable toilet requirement would benefit the water quality in high-use coves.

There is the chance that lakeshore sanitation could deteriorate in urban park and urban natural zones under this alternative. These zones allow for increased visitor use. With increased use, regulations related to sanitation and illegal refueling of motorized vessels would be more difficult to enforce. Illegal activities could continue to degrade water quality, which could lead to moderate impacts on water quality in high-use coves.

Components of the concession operations at the marinas, especially those associated with fueling and boat maintenance, could create minor to moderate impacts on water quality within the marina area. The National Park Service provides guidance on best management practices for the handling of fueling areas and boat maintenance for concessioners and the boating public. The purpose of these practices is to reduce the pollutants entering the lakes due to fueling and boat maintenance activities and to promote environmental awareness among the primarily urban user groups. With the management requirements and education reducing the levels of these impacts, the impacts would be expected to be minor. However, an accidental spill could occur and create moderate to major impacts in the marinas.

Under this alternative, there is the potential that the refueling of motorized vessels could continue to add gasoline and gasoline additives to the waters in high-use areas, reducing the water quality in these areas. According to observations by park staff, the main user group that refuels in the water are personal watercraft users. Higher levels of enforcement of the regulations and increased education could help reduce this activity. This activity creates moderate impacts on water quality, as state water standards have been approached in busy coves during the high-use period from May through September.

No additional protection of water quality would occur in the sensitive inflow areas of Lake Mead. Minor impacts on water quality could occur in these areas from the continued and increased use of motorized vessels.

The continued use of carbureted two-stroke engines would result in the continued deposition of gasoline and gasoline additives into the water. Impacts on water quality from this would occur primarily during the summer months, particularly in areas of concentrated boat and personal watercraft use. In the long-term, as older models of these engines become unusable, the newer, more efficient models required under the EPA regulations would eventually constitute the majority of boats and personal watercraft using the lakes.

The effects on drinking water would be the same as those described under alternative A.

Monitoring would continue as described under alternative A. A shoreline water quality monitoring program would be developed to systematically sample and test recreational waters at preselected sites. This would ensure that water quality requirements for recreational and other designated uses of Lakes Mead and Mohave are maintained and that antidegradation standards are not exceeded.

Impacts of Personal Watercraft Use

Personal watercraft use would continue to be authorized in all zones of the recreation area, except where prohibited by shoreline zoning or by buoys or signs. Personal watercraft use could increase during the summer months in high-use coves on Lakes Mead and Mohave. In the summer there are selected coves where personal watercraft use is concentrated, including Horsepower Cove, Saddle Cove, and Government Wash on Lake Mead, and Arizona and Nevada Telephone Coves and Cabinsite Point on

Lake Mohave. In these areas, the concentrated use of personal watercraft could create minor impacts on a temporary basis. On a grab sample in June 1999, the U.S. Geological Survey found gasoline compounds in the waters of selected coves; however, they were well within the state standards (USGS 1999).

It is anticipated that by the year 2030, 75% of the carbureted two-stroke models would be replaced by the newer, cleaner direct-injection two-stroke and four-stroke models. However, changing from carbureted two-stroke engines to two-stroke direct-injection engines may result in increases of airborne particulate-associated PAH. Further research is needed to identify what impact this would have on PAH concentrations in water.

Under Alternative D in the year 2004, personal watercraft would contribute 54% of hydrocarbon pollution at Lake Mead and 19% in 2012.

The maximum threshold volume required to meet the human health benchmark for benzene in 2004 for Lake Mead would be approximately 123,000 acre-feet or about 6% of the available mixing volume. In 2012, approximately 74,000 acre-feet or 4% of the available mixing volume would be required (see appendix G, appendix H, and tables H-13 through H-16).

In 2004 for Lake Mohave personal watercraft would require approximately 140,000 acre-feet or 7% of the available mixing volume to meet the human health benchmark for benzene and approximately 92,000 acre-feet or 13% in 2012. These adverse impacts would be considered negligible to minor.

Impacts of Other Marine Engine Use

“Table 55: Alternative D, Impacts of all Watercraft on Surface Water Quality,” compares calculated threshold volumes of water and depth of water required to meet the specified water quality standards for this alternative.

Under alternative D, there would be no restrictions on personal watercraft use, or the use of other carbureted two-stroke engines. These types of vessels would be converted to cleaner technology engines as a function of clean engine phasing in accordance with the EPA rule. Results from the combined effects of all engine types during 2004 on Lake Mead indicate that the maximum threshold volume for all vessels required to meet water quality standards would be

TABLE 55: IMPACTS OF ALL WATERCRAFT ON SURFACE WATER QUALITY UNDER ALTERNATIVE D

Threshold Volume or Depth of Water Needed to Meet Water Quality Standards									
Criteria	Constituent	Lake Mead 2004		Lake Mohave 2004		Lake Mead 2012		Lake Mohave 2012	
		Volume (af)	Depth (feet)	Volume (af)	Depth (feet)	Volume (af)	Depth (feet)	Volume (af)	Depth (feet)
Ecological Benchmarks	Benzo(a)pyrene	4,593	0.04	3,925	0.14	3,371	0.03	2,652	0.10
	Napthalene	1,818	0.02	1,553	0.06	1,334	0.01	1,049	0.04
	1-methyl Naphthalene	5,167	0.05	4,416	0.16	3,793	0.03	2,983	0.11
	Benzene	2,083	0.020	1,780	0.06	1,529	0.01	1,203	0.04
	MTBE	66	0.00	56	0.00	48	0.00	38	0.00
Arizona Standards for fish consumption	Benzo(a)pyrene	32,149	0.28	27,473	1.00	23,597	0.21	18,561	0.68
Human Health Criteria	Benzo(a)pyrene	14,613	0.13	12,488	0.45	10,726	0.10	8,437	0.31
	Benzene	225,702	2.00	192,874	7.03	165,662	1.47	130,307	4.75
Notes:									
af = acre-feet									
Lake Mead minimum pool – elevation 1,150 feet above mean sea level; total volume 16,440,000 af; volume above thermocline 2,085,000 af; surface area 112,890 square feet.									
Lake Mohave minimum pool – elevation 634 feet above mean sea level; volume 1,460,000 af; volume above thermocline 687,800 af; surface area 27,455 square feet.									

approximately 226,000 acre-feet or about 11% of available mixing volume to meet the human health benchmark for benzene.

After 2012, there would be continued phasing of cleaner engine technology. Results from analysis show that the maximum threshold volume for all vessels on Lake Mead would be approximately 166,000 or about 8% of the available mixing volume. This maximum threshold is required to meet the human health benchmark for benzene.

Results from year 2004 for Lake Mohave for all vessels would require a maximum threshold volume of approximately 193,000 acre-feet or about 28% of the available mixing volume to meet the human health benchmark for benzene.

At Lake Mohave in 2012, the human health criterion for benzene would require a maximum threshold volume of approximately 130,000 acre-feet or about 19% of the available mixing volume of water. These impacts would be considered negligible.

Chemical pollutant monitoring would be instituted in order to protect the high water quality standards for recreation. If monitoring determines that water quality standards are being violated, specific areas in the recreation area could require temporal closures.

Gasoline compounds have not been found in water samples taken near the water intake of the Southern Nevada Water System. Impacts on drinking water from the use of all marine vessels would be considered negligible under this alternative.

Impacts on Sensitive Aquatic Resources

No additional protective measures would be implemented under this alternative to protect the sensitive inflow areas of Lake Mead. The sensitive aquatic resources in these areas would continue to be exposed to the impacts from motorized vessels, including the deposition of fuel and fuel compounds. The expected growth under this alternative could lead to impacts associated with increased visitation, boating, and facility construction. These impacts could include more fuel being deposited in the water

from motorized vessels, fuel spills, construction runoff, and parking lot and road runoff. Impacts on water quality could be detectable in certain areas and certain water quality criterion could be temporarily exceeded, creating moderate impacts in these areas. These impacts are generally temporary due to the large volume of water in the lakes and the volatile nature of these compounds. These impacts would occur primarily away from the sensitive inflow areas of the lakes, except at Las Vegas Wash where different water quality standards apply. Concentrations of these compounds have not been shown at levels that would result in impairment to the aquatic system.

Cumulative Impacts

Cumulative impacts related to the water quality of the inflow areas of Lake Mead would be the same as those described under alternative A. The additional regulations related to sanitation and portable toilet requirements would serve to enhance the water quality over the long-term in high-use areas around the lakes. Once the full force of the EPA regulations are in place at Lake Mead National Recreation Area, after 2025, the water quality in areas of concentrated watercraft use should improve. However, up to that time, the operation of carbureted two-stroke engines would continue to negatively impact water quality in high-use areas.

Conclusion

Under alternative D, water quality would likely improve in camping and high-use areas from the portable toilet requirements and the placement of additional restroom facilities. In the long-term, over the next 20 years, as carbureted two-stroke engines are replaced by direct-injection two-stroke and four-stroke engines, water quality in high-use areas should improve. However, until then, water quality in high-use coves during peak periods of use could experience minor to moderate impacts. There is the potential that activities related to sanitation and refueling could continue to create moderate to major impacts on water quality in high-use areas. Antidegradation standards could be surpassed during high-use periods, and certain areas could be temporarily or permanently closed to recreational use.

The total boating capacity for both lakes under alternative D is 5,800 boats at one time. In 2004 at Lake Mead, a maximum threshold volume of approximately 226,000 acre-feet or about 11% of the available mixing volume would be required to meet water quality standards. This would be considered a negligible to minor adverse impact.

With further reduction in emissions in the year 2012 at Lake Mead, maximum threshold volume would decrease to approximately 166,000 acre-feet or about 8% of the available mixing volume.

The maximum threshold volume of water required to meet water quality standards at Lake Mohave in 2004 would be 193,000 or about 28% of the available mixing volume. This would also be considered a negligible to minor adverse impact.

The reduction in emissions at Lake Mohave in 2012 would require a maximum threshold volume of 130,000 acre-feet or about 19% of the available mixing volume.

The impact to water quality would be negligible to minor; however, in confined areas such as coves with high watercraft use, impacts could be detectable but would still be within water quality standards or criteria. Effects would be long-term because they would recur annually during the summer heavy-use season; however, water quality would remain within historical or desired water quality conditions.

Implementation of this alternative would not result in an impairment of the water quality resource.

VEGETATION INCLUDING SHORELINE VEGETATION

Impacts

The impact on vegetation from the expansion of existing facilities and the construction of new facilities would be the same as those described under alternative C.

Lakes Mead and Lake Mohave do not have sensitive grasses and submerged aquatic vegetation near the shoreline areas, except in the sensitive inflow areas. Native species, such as willows and cottonwoods, do exist at certain shoreline areas, primarily in the sensitive inflow areas of Lake Mead and around Lake Mohave where water levels fluctuate only 15 feet per

year. In addition, there are several rare or sensitive plant species that are located under the high-water line or within walking distance of the lake. These species could be directly impacted by recreational use, such as from tree cutting for firewood or the trampling of small plants. These types of impacts would be considered minor to moderate impacts. Under a worst-case scenario, they could cause a change in the plant community by altering the abundance, quantity, and quality of vegetation over a localized area.

Some rare plants are known to occur along the shorelines of both Lakes Mead and Mohave. These populations have been documented and are monitored periodically. Under this alternative, these locations would continue to be monitored, and if additional protection was necessary, recreational use would be managed to provide greater protection to the habitat of these plants. No shoreline zoning would occur specifically for the purposes of protecting rare plants and their habitat at this time. There would be no additional level of protection for rare plant species that could be located under the high-water elevation, such as the sticky buckwheat, three-sided milkvetch, smoke tree, *Las Vegas bearpoppy*, *sticky ringstem*, and *Trixis californica* (no common name). Continued and increased visitor use in areas where these rare plants are located could damage the habitat by trampling and soil disturbance and decrease the number of plants in existence. The amount of high-quality habitat that would be impacted would be low because most of the high-quality habitat is above the high-water line and visitor use would be concentrated along the shoreline, which is below the high-water line.

As described in the “Impacts of Alternative A” section fluctuating lake levels, especially on Lake Mead, can eliminate habitat as lake levels rise, or expose and create habitat as lake levels drop. The Bureau of Reclamation regulates lake levels, and large fluctuations can occur periodically; therefore, the National Park Service cannot mitigate impacts on potential or existing rare plant habitat that could occur below high-water elevations.

Potential habitat for the Las Vegas bearpoppy does exist around the proposed expansion site at Stewarts Point. However, the proposed development site would occur in previously disturbed areas, probably below the lake high-water line, and would likely have no impact on existing bearpoppy habitat. Surveys would be completed prior to construction, and plants

would be avoided to ensure the protection of this species. Impacts on rare plants under this alternative would be minor.

No shoreline enhancement would occur under this alternative. Exotic salt cedar would not be removed from shoreline areas and native riparian vegetation would not be planted, and therefore, the native community would not be restored in the selected areas.

Impacts of Personal Watercraft Use

Personal watercraft users could access shoreline areas like other boaters and could create the same impacts as described in the previous section.

Cumulative Impacts

Cumulative impacts on native plants would be the same as those described in the “Impacts of Alternative A” section. Damage to vegetation at the expansion and development sites would be on a localized basis and would not cause any long-term significant cumulative impacts on the dominant vegetative community within the recreation area. Habitat for rare plants would be protected.

Conclusion

Minor impacts on vegetation would occur on a localized basis around construction sites. Topsoil would be removed prior to construction and replaced afterwards, where feasible, to save the seedbase and assist with restoration. Revegetation and landscaping with native vegetation would occur to replace vegetation. Because of the small size of the impact area compared with the size of the resource base, no impairment to the vegetative community would occur. Sensitive plant habitat could be slightly damaged by occasional visitor use in shoreline areas. Sensitive plant habitat would be monitored and additional levels of protection due to increased recreational activities would be implemented if deemed necessary by park resource managers. The impacts on vegetation from the implementation of this alternative would not impair the overall resource base of Lake Mead National Recreation Area.

WILDLIFE AND WILDLIFE HABITAT

Impacts on wildlife from construction activities would be the same as those described under alternative C.

No additional protection would be garnered to aquatic habitat around the sensitive inflow areas of Lake Mead or in the Black Canyon on Lake Mohave above Willow Beach. The establishment of a 300-foot flat-wake zone along the shorelines of Lakes Mead and Mohave could afford some protection to wildlife in shoreline zones. However, because motorized vessels could continue to access the sensitive wildlife areas, impacts of noise and disturbance would continue to cause an impact on these resources. Wildlife could be temporarily or permanently displaced from their nesting sites or other habitat in these areas. Overall, the impact on birds from motorized vessels would be considered a major impact. Motorized use occurs at critical periods during nesting season and migration periods. Habitat in the area is limited, and there could be an increase in mortality of these species from increasing use of motorized vessels in the inflow areas and around important nesting areas along Lake Mohave.

Additional shoreline fishing facilities would be developed under this alternative, like those described under alternative C. The impacts would be the same as those described under alternative C.

Impacts of Personal Watercraft Use

Personal watercraft would continue to be authorized in all zones on Lakes Mead and Mohave except where prohibited by buoys or signs. Noise, wake, and disturbance from personal watercraft use would primarily impact the wildlife in the sensitive inflow areas. Currently, personal watercraft use in these areas is low; however, it would be anticipated that use throughout the recreation area would grow gradually over time. Increased personal watercraft use in these areas could lead to moderate to major adverse impacts. Breeding animals, primarily birds, are present in these inflow areas during particularly vulnerable life stages, including during migration and during winter. Personal watercraft and other motorized vessels have been shown to disturb birds and can flush them from their roosts or nests. This could lead to the mortality of individuals; however, it would not be expected to threaten the continued existence of these species in the park.

Personal watercraft and other watercraft noise may temporarily affect wildlife such as coyotes and bighorn sheep that visit the shoreline primarily for water. Wildlife, in general, move away from disturbances such as approaching motorized vessels. However, biologists from National Park Service have observed unpredictable responses from bighorn sheep near the shoreline. At times, they will move away when a vessel is approaching and return when it moves away. Other times they will ignore the approaching vessel and not move. This indicates that any effects personal watercraft and other motorized watercraft have on bighorn sheep is minimal. Coyotes are very transient animals that have a high tolerance for human activity.

These impacts could be reduced to a moderate level if the 300-foot shoreline flat-wake zone is implemented in the park. This would prevent disturbance of shoreline wildlife habitat by high-speed vessels.

Cumulative Impacts

Proposed facility construction would result in the disturbance or loss of habitat. The irretrievable commitment of this acreage to development precludes its use as wildlife habitat. Based on the amount of available habitat adjacent to or near the construction sites, it would be unlikely that construction would have significant cumulative impacts on wildlife habitat in the recreation area or on a regional context.

There could be potential cumulative impacts if visitation and use of the lake by motorized vessels continues to increase, especially in sensitive inflow areas where the nesting sites for many aquatic bird species are located. The 300-foot shoreline flat-wake zone should garner limited protection to these species; however, visitors in motorized vessels would still have access to these areas and could continue to disturb these species through noise and human intrusion. As visitation increases in these areas, over time, bird species could abandon this habitat due to increased disturbance by motorized vessels, and this could result in a loss of bird species diversity within the recreation area and potentially in the Southwest, as Lake Mead has been shown to be one of the primary water courses for migratory bird species.

Conclusion

Wildlife could be disturbed at the construction sites during the construction periods, and marginal wildlife habitat would be removed. Wildlife species at construction sites that could not move from the area could be destroyed by construction activities. Based on the mitigation measures and the amount of undisturbed habitat adjacent to or nearby the development area, this impact would be minor. Construction projects along the lakeshore could temporarily impact aquatic habitat by increasing turbidity. This impact would be short-term and localized during construction activities and would be considered minor.

This alternative would provide for minimal protection of wildlife species within the recreation area from the use of motorized vessels in sensitive and important habitat. Sensitive species around inflow areas, particularly birds, could continue to be disturbed by the use of motorized vessels, even with the no-wake regulation. Nesting bird habitat could be impacted from the continued use of motorized vessels within sensitive roosting and nesting areas in the recreation area. However, the impacts of implementing this alternative would not impair the wildlife in the recreation area.

THREATENED AND ENDANGERED SPECIES

Prior to undertaking any action, an assessment of its effects on endangered, threatened, proposed, or candidate animal species would be conducted in consultation with the U.S. Fish and Wildlife Service as necessary. Protection of these species would receive the highest consideration in project planning.

Impacts

Desert tortoises have a patchy distribution at Lake Mead and throughout their range. Most of the park supports low densities of tortoises with a few hot spots of higher densities. Although monitoring plots and sign transects have helped identify areas of concern, it has not been possible to calculate accurate numeric densities for any area in the park. Methodologies for determining tortoise density have been debated for years and are still a major focus of discussion among biologists and land managers.

Developed areas, parking lots, and boat launch areas, whether at Cottonwood Cove, Eldorado Landing, Stewarts Point, or Overton Beach, are located in marginal habitat with low tortoise densities, and management of these facilities poses little threat to the species. Access roads typically run through more suitable habitat, where the chance of tortoise impacts increases. Tortoise density is low near the access road to Stewarts Point. Tortoise densities near the access roads to Cottonwood Cove and Eldorado landing are low to medium but are particularly hard to quantify because drought-induced mortality has significantly reduced populations in those areas. The access road to Overton Beach poses the greatest concern. High tortoise densities have been found on a monitoring plot located near the intersection of the access road and Northshore Road, and tortoises are occasionally seen on the access road. Impacts to tortoises are considered in management of this area.

Vehicle-related mortalities associated with roads and illegal collection and harassment by people using the recreation area can adversely affect the desert tortoise. Area educational campaigns have probably helped to reduce this impact.

The expansion of existing facilities at Cottonwood Cove and Overton Beach would have the same potential impacts as those described under alternative A in terms of potential impacts on desert tortoises. The National Park Service would work with the U.S. Fish and Wildlife Service to develop mitigation to reduce or eliminate potential adverse impacts on desert tortoises from construction activities during the expansion of any of the developed areas. In addition, the proposed development at Eldorado Canyon is located in a Desert Wildlife Management Area established to protect wildlife, such as the desert tortoise and its habitat. It might not be feasible to develop the site due to the proximity to critical desert tortoise habitat and the potential of flood hazards. Stewarts Point is also located in potential desert tortoise habitat. The same mitigation would apply to these areas to protect desert tortoise habitat and ensure compliance with the *Endangered Species Act*. While the take of desert tortoises would be unlikely, it is a possibility. Increased visitor use could potentially disturb bald eagles and peregrine falcons. However, because areas used by the endangered bald eagle and sensitive peregrine falcon are high cliffs, well above the lakes, direct disturbance would not occur even if visitor use increases. In addition, bald eagles normally use these areas in the winter, during periods of low visitor use, and have not used the areas for nesting. Therefore,

the increased visitor use during the summer would not likely adversely affect bald eagles. Peregrine falcons do nest in areas adjacent to Lakes Mead and Mohave, but these nesting sites are located on high cliffs and the additional proposed facilities under this alternative are not near known nesting locations.

Minimal protection would be afforded by the establishment of a 300-foot flat-wake zone around the shoreline in the sensitive inflow areas, which are potential or known willow flycatcher habitat. Motorized use proximate to willow flycatcher habitat, even with no wake, could disturb this species and cause them to abandon the area. No additional zoning would occur in the sensitive inflow areas.

There would be no impact on the California brown pelican since it is a transient, infrequent visitor to the recreation area. The flat-wake zone could protect potential habitat for the Yuma clapper rail and the Western snowy plover, though they would not be protected from motorized use. Neither of these species has been found within the recreation area, though potential habitat exists. This alternative would not likely adversely affect these species.

The impacts of recreational use, including boating and personal watercraft use, on endangered razorback suckers and endangered bonytail chub has not been thoroughly studied within the recreation area. Razorback suckers spawn from January through early April and occupy specific shoreline areas at this time. It is likely they are more sensitive to disturbance during this period. However, this would be a period of low visitor use, and increased visitor use during the summer would not likely adversely affect razorback suckers.

Bonytail chub are known to spawn during May, when increasing numbers of visitors are using the lakes. Impacts of recreational use to this species are unknown. Annual surveys would continue in an attempt to locate the species and its spawning areas and to determine if recreational use creates adverse impacts. Should bonytail chub spawning areas be found, and if monitoring determines that recreational use impacts these species, the National Park Service would work with the Native Fish work Group to determine what actions, including temporal closures and wake restrictions, would be necessary to provide further protection. The implementation of a 300-foot flat-wake zone around the shorelines of both lakes could serve to further protect these species from disturbance during their critical spawning periods.

However, no management actions related to recreation management would be implemented under this alternative at this time to provide additional protection to these species.

Endangered fish recovery efforts would continue for the razorback sucker with the capturing of larvae in the spring and rearing them in grow-out ponds located along the shoreline of Lake Mohave. The National Park Service would continue to cooperate with state and federal agencies to use facilities within and outside of the recreation area for razorback sucker grow-out areas.

The stocking of game species is coordinated with the U.S. Fish and Wildlife Service, the Arizona Game and Fish Department, and the Nevada Division of Wildlife. Stocking sites could be expanded to include all development sites if and when fishing enhancements were developed. The National Park Service would coordinate with the fisheries management agencies to ensure the stocking of games species would not conflict with the management of the endangered native fish.

The construction of launch ramps at Eldorado Canyon and Stewarts Point could create turbidity in the waters adjacent to these sites, thus temporarily reducing the quality of the aquatic habitat on a short-term basis. While neither of these areas is a known spawning area for endangered fish species, the National Park Service would work with the U.S. Fish and Wildlife Service to ensure that construction activities would not impact these fish species.

The continued use of carbureted two-stroke engines would continue to deposit fuel and gasoline-related compounds and PAH combustion products into the waters, including in razorback sucker and bonytail chub habitat, which could lead to detrimental impacts on these species. While concentrations in Lake Mohave have not been recorded at levels that impair the health of the aquatic system, the long-term effects to the health of these endemic fish are not known. The amount of water in the lakes would dilute these chemicals and reduce any potential impacts on the aquatic habitat. As carbureted two-stroke engines were replaced, it would be likely there would be a beneficial impact on the overall aquatic ecosystem and to endemic fish habitat. However, recent studies have shown that changing from carbureted two-stroke engines to two-stroke direct-injection engines may result in increases of airborne particulate-associated PAH (*Drowning in Noise: Noise Costs of*

Jet Skis in America, Kado et al. 2000). Further research outside the scope of this planning effort is needed to identify what impact this would have on PAH concentrations in water.

The relict leopard frog (*Rana onca*), while not a listed species under the *Endangered Species Act*, is a species of concern at the Lake Mead National Recreation Area. This frog was once thought to be extinct, but populations have been found at several springs within the recreation area in the past five years. Some of these springs are near the lake and are destinations for water-based recreationists on Lake Mohave. Increased recreational use of these springs, particularly hiking to them and damming them, could adversely affect relict leopard frog populations in these areas. However, since most of the critical areas for the frogs are located in areas with thick vegetation and visitors generally avoid these areas, impacts on frogs from recreational use have not occurred.

Impacts of Personal Watercraft Use

The continued use of personal watercraft with carbureted two-stroke engines would continue to deposit fuel and gasoline-related compounds into the waters, including in razorback sucker and bonytail chub habitat, which could lead to detrimental impacts on these species. While chemical concentrations in Lake Mohave have not been recorded at levels that impair the health of the aquatic system, the long-term effects on the health of these endemic fish are not known. It is likely that the amount of water in the lakes dilutes these chemicals and would reduce any potential impacts on the aquatic habitat. As carbureted two-stroke engines are replaced, it is likely there would be a beneficial impact on the overall aquatic ecosystem and to endemic fish habitat. The full benefit of this impact would not likely occur until after 2025.

The 300-foot shoreline flat-wake zone should provide additional protection to Southwestern willow flycatcher habitat, to bald eagle and peregrine falcon habitat, and to potential Yuma clapper rail and snowy plover habitat. The flat-wake zone would lead to reduced use in those areas by personal watercraft, as they would no longer be able to travel through these areas at a high rate of speed.

The primary season for personal watercraft use is in the summer months, from late May until September. This is after the spawning period for the razorback

sucker and near the end of the spawning season for the bonytail chub. Therefore, continued personal watercraft use should not impact these species during their critical periods. Also, the 300-foot flat-wake zone would reduce personal watercraft use along the shoreline. Therefore, the continued use of personal watercraft would not likely adversely effect threatened and endangered species within the recreation area.

Cumulative Impacts

Lake Mead National Recreation Area preserves important habitat of several species listed as threatened or endangered. While lands within the Las Vegas Valley are being lost to development, lands within the recreation area and other federal areas around Las Vegas are given funding through the multiple species habitat conservation planning process to help further protect these species. This alternative would not add to the total amount of land protected in the region. The 300-foot flat-wake zone could benefit shoreline species, primarily the Southwestern willow flycatcher, by providing better protection of their habitat.

Conclusion

There could be potential adverse impacts from this alternative on threatened or endangered species. Mitigation measures should serve to reduce or eliminate any potential impacts on these species. Monitoring would occur on threatened and endangered fish species, and special zoning on either lake might be implemented if determined necessary by park biologists in consultation with fisheries managers. The 300-foot flat-wake zone could have a beneficial impact on threatened and endangered species or habitat located in shoreline areas.

Under the evaluation of section 7 of the *Endangered Species Act*, the determination has been made that this alternative would have no effect on the California brown pelican and would not likely adversely affect the bald eagle, peregrine falcon, Yuma clapper rail, Western snowy plover, or willow flycatcher. Implementing this alternative would likely cause some adverse effects from continued recreational activities creating temporary disturbances during spawning activities; therefore, this action would likely adversely affect razorback suckers and bonytail chub. However, additional

protection might be provided through the implementation of the 300-foot shoreline flat-wake zone.

Due to the nature of proposed construction activities within desert tortoise habitat, there is the potential to adversely affect the desert tortoise from direct take or the loss of burrows or other habitat features. However, mitigation measures would be in place prior to any construction activity.

There would be no impairment to threatened, endangered, or species of concern from the impacts resulting under this alternative.

CULTURAL RESOURCES

Impacts

To protect cultural resources and to comply with the *National Historic Preservation Act*, all proposed projects would be evaluated to determine the area of potential effect. These areas would be inventoried for significant cultural resources and a determination would be made as to what impact the project would have on the historic qualities of the resources. Through consultation with project designers, affiliate tribal entities, the respective State Historic Preservation Offices, and the Advisory Council on Historic Preservation, a plan would be developed to avoid or mitigate impacts.

Impacts of Personal Watercraft Use

No impacts would occur on cultural resources from the continued use of personal watercraft in the recreation area.

Cumulative Impacts

No significant cumulative impacts on cultural resources would be anticipated.

Conclusion

Site design and coordination with the cultural resources manager would ensure that no cultural resources are damaged under this alternative. There would be no impairment to cultural resources from the impacts resulting from this alternative.

VISITOR USE, EXPERIENCE, AND SAFETY

Impacts

Under this alternative, the lakes would be managed for concentrated use, with a smaller range of recreational opportunities. Both lakes would be zoned for a combination of rural natural, urban natural, and urban park, with 78% of the combined acreages of the lakes zoned for urban park or urban natural.

In these urban areas, boating densities could approach four acres per boat and could exceed lake carrying capacity standards. There would be intense visitor use with congestion and high social contact in the urbanized areas along the lakeshore. Shoreline zoning would be mandatory and exclusive in an attempt to reduce conflicts. As lake capacities were exceeded, high-use areas would become overcrowded, which could lead to visitor dissatisfaction and an unsafe environment. The high boating densities and overcrowding could create moderate to major impacts on the recreational experience.

There would be no areas specifically managed for primitive or semiprimitive recreational experiences. Encounters with other visitors and motorized vessels would be normal in all areas of the lakes, including Black Canyon on Lake Mohave. This could lead to visitor dissatisfaction by those visitors who use nonmotorized vessels. Since there would be no areas set aside for nonmotorized uses, the recreational experience of some user groups, such as kayakers and canoeists, could be displaced from the recreation area.

The 300-foot flat-wake zone could serve to reduce some conflicts between nonmotorized and motorized user groups and create a safer recreational environment. However, visitors who are used to traveling freely within the majority of the recreation area might be disappointed that such a large component of the shoreline has a flat-wake speed limit imposed. The flat-wake speed would serve to limit speeds throughout the narrow portions of the recreation area. The experience of visitors used to traveling at high speeds through these areas could be moderately impacted. Improved safety in these areas could be an immediate beneficial impact.

Strict zoning would limit conflict between different user groups and improve the recreational experience

for some visitors. However, some visitors might not like the restricted uses imposed by zoning and might have a negative recreational experience because of the zoning. This could create moderate impacts on the recreational experience in these areas as visitor satisfaction declines.

Visitors who currently enjoy camping at Boxcar Cove, Crawdad Cove, [at the end of 8.0 Mile Road](#), Kingman Wash, and Eldorado Canyon would be negatively impacted, as these areas would be designated as day use only areas. However, improvements in these areas, such as shade shelters and backcountry bathrooms, could improve the recreational experience for other visitors. Plus, since these areas are located in 100-year floodplains, visitors would be protected by the restrictions and a safer recreational environment would be established.

Boating education requirements could create a safer and improved boating experience for visitors on Lakes Mead and Mohave. However, some boat operators might not understand the benefit of the education and might reject it. In addition, some recreational users might not agree with the alcohol restrictions proposed under this alternative and might illegally use alcohol within the recreation area. These activities could lead to law enforcement actions, including citations or arrests, and could lead to visitor dissatisfaction, injuries, fatalities, and property damage.

Shoreline sanitation would improve with the implementation of the requirement for using portable toilets. Less human waste and related trash would exist on the shoreline areas, especially in the heavy-use areas. This would improve the recreational experience of visitors who use the shoreline resource. The expense of purchasing these portable toilets could create hardship for lake users; however, there are many options for purchasing these units and a reasonable range of costs.

The impact on the recreational user and safety from implementing a parkwide litter program, which involves prohibiting glass [and styrofoam](#) containers in the recreation area, would be the same as those described under alternative C.

Impacts of Personal Watercraft Use

Personal watercraft use would continue to be authorized in the majority of Lakes Mead and

Mohave, except where specifically prohibited by buoys or signs. The creation of a 300-foot [flat-wake](#) zone at the water's edge along Lakes Mead and Mohave would reduce conflicts between personal watercraft users and other recreationists, especially those who are swimming or fishing along the shoreline. The [flat-wake](#) zone could reduce safety risks from grounding and from persons getting struck by watercraft along the shoreline. However, since many personal watercraft users enjoy utilizing the shoreline areas for their recreational experience, these users could experience moderately negative impacts from the reduction of areas available for high-speed travel.

Cumulative Impacts

The cumulative impacts resulting from the boating education, sanitation, and litter requirements would be the same as those described under alternative C. In general, there could be negative cumulative impacts resulting from this alternative as visitor use increases. As crowding increases, visitors might look elsewhere for their recreational experiences. This could impact visitor use in lakes within the region and throughout the Southwest as displaced visitors seek other opportunities for water-based recreation.

Conclusion

Visitor experience would likely deteriorate with the implementation of this alternative. Visitor conflicts should decrease due to recreational zoning [and the implementation of the 300-foot shoreline flat-wake zone](#), but the additional restrictions might limit visitor use and create visitor dissatisfaction. Safety should improve with the proposed restrictions, including prohibited alcohol use and the 300-foot [flat-wake](#) zone, but safety might eventually deteriorate as overcrowding and congestion occur both on the lake and at adjacent facilities.

Visitors would not have the full spectrum of opportunities to enjoy a variety of recreational settings within the recreation area. This would cause certain visitors to be dissatisfied with their recreational experience.

SOUNDSCAPES

Impacts

Under alternative D carbureted two-stroke engines would continue with a mix of cleaner engine types through the life of the plan. Most visitors to Lakes Mead and Mohave have expectations of noise from motorized vessels during their visit except in the winter months during periods of low use by motorized vessels. According to visitor use surveys, more than 60% of all visitors to the recreation area utilize motorized vessels as part of their experience (Graefe and Holland 1997). During peak use, personal watercraft account for approximately 30% of all boats on the water. Expectations of noise vary depending on the area on the lakes.

Under this alternative, there would be no opportunity for a primitive or semiprimitive recreational experience on the lakes as no areas would be zoned for such purposes. Noise from motorized vessels would be audible in most areas, including the upper Black Canyon. Visitors who expect a quiet recreational experience where the natural sounds are the predominant sound would be disappointed under this alternative as those areas would not exist on the lakes. If visitors expect to hear natural sounds in the more isolated regions of the recreation area and human-generated noises are prevalent there, the impact could be moderate to major.

Wildlife and shoreline habitat could receive additional protection through the establishment of a 300-foot flat-wake zone. There would be no additional protection in the sensitive areas. The flat-wake zone could protect the resources from noise-related impacts and could reduce impacts from noise to shoreline users. However, some boats are louder when idling and operating at flat-wake speeds than when cruising at normal speeds so there may be no beneficial impacts.

Human-generated noise would be the dominant sound, primarily during the summer, in the busy coves. However, because there is an expectation by the visitors that there would be noise in busy coves during the summer, the impact would be moderate. Human-generated noise from motorized vessels in areas away from the marinas and high-use areas would continue to occur.

The noise from motorized vessels could be reduced along the shoreline with the implementation of a 300-

foot flat-wake zone. However, some boats are louder when idling and operating at flat-wake speeds than when cruising at normal speeds, so the beneficial impacts of the flat-wake zone on the soundscape at the shoreline would be considered slight.

Under this alternative, the National Park Service would comply with the state of Nevada boating noise regulations. These regulations are not based on specific noise levels at specific distances and should be easier to enforce than the previous regulations. Because the new rules will be easier to enforce, it is anticipated that the noise issues would be addressed and the shoreline and boating environment improved on both Lakes Mead and Mohave.

In addition to the noise from the use of motorized vessels, there would be noise created from the construction activities during the expansion of the developed areas. This noise would be temporary, would occur only during the operation of heavy equipment, and would be localized within the existing development zones; therefore, impacts would be considered minor.

Impacts of Personal Watercraft Use

Personal watercraft would continue to be permitted in large portions of the recreation area. The state of Nevada noise standard adopted under this alternative would prohibit the use of motorized vessels with noise levels exceeding 75 A-weighted decibels measured at the shoreline, independent of speed or distance. The National Park Service would promulgate regulations for enforcement of the boating noise standards, which would be consistent with the Nevada standards, to reduce the noise from vessels operating over 75 decibels. Most visitors to the lakes have some expectation of noise from watercraft, including personal watercraft. However, some visitors could continue to be negatively impacted by noise from personal watercraft due to the nature of the noise. Frequent changes in pitch and loudness caused by rapid acceleration, deceleration, and change of direction could remain noticeable to some recreationists.

After 2025, noise from carbureted two-stroke personal watercraft would be reduced as the direct-injection two-stroke and four-stroke engines replace the older carbureted two-stroke models. The direct-injection two-stroke and four-stroke models have been reported to be quieter than older models (PWIA

2001) and would comply with federal and state noise standards.

The 300-foot [flat-wake](#) zone would reduce the number of personal watercraft traveling at high speeds close to shore. As noise is reduced with distance, this would serve to reduce the disturbance from noise to shoreline users, creating slight beneficial impacts.

Cumulative Impacts

Impacts would be [similar to alternative C up until 2012; after 2012, impacts would be similar to those described under alternative A.](#)

Conclusion

Noise from motorized vessels would continue to impact recreationists in all areas of Lakes Mead and Mohave. There would be no areas zoned to limit motorized vessels. Considering the enabling legislation, the history of motorized vessel use at Lake Mead National Recreation Area, and the park's goals and objectives to protect park resources and values, some noise from this source of recreational use is appropriate. Noise from motorized vessels would continue to have a moderate impact on the soundscape in all areas of Lakes Mead and Mohave. [The National Park Service would promulgate regulations for enforcement of the boating noise standards, which would be consistent with the Nevada standards, to reduce the noise from vessels operating over 75 decibels. The 300-foot flat-wake zone could reduce noise from motorized vessels at the shoreline, although some boats are louder while idling and operating at flat-wake speeds than while cruising at normal speeds.](#)

There could be moderate to major impacts in the sensitive inflow areas from the noise associated with existing and increasing use by motorized vessels. The impact would negatively affect the wildlife located there and visitors with the expectation of natural quiet. [Impacts under alternative D would not result in impairment to the park's soundscape.](#)

SOCIOECONOMIC RESOURCES

Impacts

Specific concessioners located where facility expansion is authorized would benefit financially because they would be able to offer additional services and serve more visitors. The facilities at Willow Beach would not be impacted under this alternative, as there would be no primitive or semiprimitive zoning in Black Canyon.

Concessioners could benefit slightly from the sale or rental of portable toilets, but this benefit would likely be negated by the restriction on the sale of alcoholic beverages and products packaged in glass and styrofoam.

The restrictions on the sale of alcohol and alcohol consumption within the recreation area would detrimentally impact park concessioners that rely on these sales for part of their yearly gross revenue. Since glass beverages and styrofoam would be restricted parkwide under this alternative, concessioners would not benefit from the sale of these items either. According to the annual financial reports in 1998 and 1999, the combined sale of groceries and packaged liquor varied between 4% and 10% of the total yearly gross, depending on the park concessioner. Records are not kept on what percentage of sales are comprised of items that are alcoholic beverages or are packaged in glass or styrofoam containers, but it is a portion of this percentage. The degree of impact under this alternative to concessioner revenue would be more than under alternatives B and C since this alternative would be more restrictive.

Park concessioners could benefit as recreational use increases in the urban park and urban natural settings, bringing greater numbers and concentrations of park visitors into the developed areas. In addition, services in communities adjacent to Lake Mead National Recreation Area would continue to benefit as visitors to the recreation area travel through these communities or use them as a base for their visits to the lakes.

Impacts of Personal Watercraft Use

Since there would be no ban imposed on personal watercraft use, and no restrictions based on the EPA regulations, area businesses and the recreation area

concessioners currently operating would not be negatively impacted under this alternative. Their rental and sales operation would continue to function as normal.

Cumulative Impacts

Increased services and improved recreational opportunities within the park could cause increased visitation. Additional development outside the park in adjacent communities could result. Also, increased visitation could cause increased pressure for more development inside the park. Over time, higher levels of visitation could lead to an increased need for upkeep and maintenance of concession facilities, which could temporarily reduce profits.

Conclusion

Eliminating the sale of alcoholic beverages, glass containers, and styrofoam within the recreation area could negatively impact park concessioners but increased park visitation, and the authorized expansion could benefit park concessioners. Adjacent communities could benefit from increased visitation to the recreation area.

Businesses that sell or rent personal watercraft and other two-stroke engines would not be negatively impacted by this alternative.

PARK OPERATIONS

Impacts

Impacts on the park operations in terms of adequate law enforcement coverage to implement this alternative would increase as much as under alternative A, with an additional 12 law enforcement officers to regulate recreational zoning in urban interface areas, to patrol additional developed areas, and to enforce the new restrictions on alcohol use. Two more law enforcement officers per lake and five to six more interpreters for each lake would be required to implement the boating safety and education program. Four more interpretive rangers, in addition to the basic requirements specified under alternative A, would be required to develop and implement an education program on the new lakeshore sanitation requirements. Three additional seasonal interpretive rangers would be required to provide education on water quality concerns related

to illegal refueling activities in the recreation area. A 50% increase in maintenance staff would be necessary to maintain the existing facilities, and six more maintenance personnel per lake would be required to install and maintain the increased numbers of backcountry toilets. In addition, 10 more maintenance personnel would be required per lake for maintenance activities due to the increased urbanization and related increased demand to maintain park facilities. Six more personnel, two boats, and a budget for supplies, equipment, and laboratory fees would be necessary during the summer months to implement the water-monitoring program.

Cumulative Impacts

Impacts would be the same as those described under alternative B.

Conclusion

Approximately 169 additional full-time or seasonal positions would be required to implement this alternative.

SUSTAINABILITY AND LONG-TERM MANAGEMENT

The impacts associated with this alternative would be similar to those under alternative C, but they could potentially create a higher level of impact, primarily due to zoning differences. Allowing increased visitor use along the lakeshore in urban natural and urban park zones would focus visitation and impacts on these areas. The increased visitation would be concentrated along the shoreline and would not impact the overall productivity of the Mojave Desert ecosystem.

The continued unrestricted use of carbureted two-stroke engines until after many become inoperable after 2008 could adversely impact the water quality of the lakes, and recreational water quality standards could be exceeded during certain periods in high-use areas. It is uncertain whether this impact on water quality would be an irreversible or irretrievable commitment of resources; however, it could cause immediate impacts by forcing area closures, and there is the potential that reduced water quality could harm aquatic organisms with algae blooms, suspended solids and turbidity, and oxygen depletion.

Consultation and Coordination

HISTORY OF PUBLIC INVOLVEMENT

Public meetings were initiated in January 1993 to help identify and summarize significant issues related to the management of Lakes Mead and Mohave. A notice of intent to prepare this lake management plan and environmental impact statement was published in the *Federal Register* on May 3, 1993. Between January 1993 and September 2000, a series of public scoping meetings, public informational meetings, and presentations on the development of the lake management plan were held throughout the area. A complete listing of the meeting dates and locations is found in “Appendix D: Chronology of Lake Management Plan Public Meetings and Presentations.”

The main series of public scoping meetings were held between October and December 1994. The meeting locations included Las Vegas, Henderson, Boulder City, and Overton, Nevada; Kingman, Bullhead City, and Meadview, Arizona; Riverside, California; and St. George, Utah. A mailing list of interested parties was compiled from attendees at the meetings and from any written comments received at the recreation area. In December 1996, a scoping issues newsletter was mailed to interested parties to provide an update on the issues related to the development of the plan. Public informational meetings were held in 1998 from May through July to provide more information on the development of the plan. During the entire planning process, NPS personnel were available to meet with any interested public to provide presentations related to the lake management plan. Presentations were made to various groups, including local, county, state, and federal agencies, tribal representatives, concessioners, and various clubs.

Tribal consultations were initiated in March 1996 at the Tribal Consultation Meeting in Laughlin, Nevada. Coordination meetings with the Hualapai Nation occurred in December 1997, April 1998, August 1999, and September 2000, and components of the lake management plan were presented at those meetings. Presentations were also given at the Tribal Consultation Meeting in August 1998, at the Colorado River Indian Tribal Meeting in November 1998, and at the Native American Tribal Consultation Meeting in March 1999. Participating tribes at one or more of these meetings included the Southern Paiute Consortium, including the Las Vegas Southern Paiute, Las Vegas Indian Center, Pahrump, Moapa, Kaibab, and Paiute Indian Tribes of Utah; and the

Colorado River Groups, including the Chemhuevi, Mojave, Quechan, Maricopa, Ak Chin, Crit, Hopi, Navajo, Zuni, Havasupai, and Yavapai.

Following release of the *Draft Environmental Impact Statement / Lake Management Plan*, there was a 60-day public review and comment period on the document. The 60-day review period ended on June 26, 2002.

Thirty days after distribution of the document, from May 13–23, public open houses were held in Meadview, Bullhead City, and Kingman, Arizona; and Moapa, Las Vegas, and Boulder City, Nevada.

Members of the NPS interdisciplinary planning team were available at the open houses to answer questions concerning the plan. Comment sheets were provided for people to submit written comments, and a stenographer was on hand to record verbal comments. The public was also encouraged to comment via the Internet at <http://www.LAME.LMP@nps.gov>.

The National Park Service and its contractor analyzed all comments that were received during the public comment period in order to identify and respond to substantive issues. The introduction to Volume 2, “Comments and Responses to the Draft Environmental Impact Statement / Lake Management Plan,” contains a description of the purpose and methodology used in reviewing and responding to public comments and describes the organization of that volume.

The National Park Service met with the Town Board and Chamber of Commerce of Laughlin, Nevada, to discuss specific aspects of the plan. Meetings were similarly held with the Searchlight, Nevada Town Board. A specific meeting was held with representatives of WON BASS and BASS, and additional telephone conversations with B.A.S.S. occurred with regard to tournament fishing on Lake Mead. There have been additional briefings, both face-to-face and conference telephone calls, with members the Arizona and Nevada Congressional Delegations.

The National Park Service met with representatives of the Nevada Division of Wildlife and Arizona Game and Fish Department concerning lake zoning

and boating regulations on Lakes Mead and Mohave. The Park Service attended a specific meeting with the Nevada Wildlife Advisory Board, as well as meeting with state agency representatives from both Nevada and Arizona.

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MAILING LIST

Postcards were sent to more than 1,000 organizations, businesses, corporations, and individuals to notify them of the availability of the *Draft Environmental Impact Statement / Lake Management Plan*. This document was provided to those who requested a copy in writing or by telephone, and it is available on the Lake Mead National Recreation Area Web site. In addition, the document was provided to the following federal, state, county, and local agencies; officials; area public libraries; and Lake Mead National Recreation Area concessioners.

Federal Agencies

U.S. Army Corps of Engineers

Bureau of Land Management, Nevada and Arizona

Bureau of Indian Affairs

Bureau of Reclamation

Environmental Protection Agency

U.S. Fish and Wildlife Service

Natural Resources Conservation Service

Federal Highway Administration

Bureau of Mines

U.S. Forest Service

State of Nevada

Honorable John Ensign, United States Senator

Honorable Harry Reid, United States Senator

Honorable Shelley Berkley, United States
Representative

Honorable Kenny Guinn, Governor

Department of Administration, State Clearinghouse

Division of Parks

Division of Wildlife

Division of Environmental Protection

Division of Historic Preservation and Archaeology

Department of Transportation

Land Use Planning Advisory Committee

State Historic Preservation Office

Division of Forestry

Colorado River Commission

City of Las Vegas

City of Boulder City

City of Henderson

City of Mesquite

City of Laughlin

Moapa Valley

Clark County

Chambers of Commerce, Las Vegas and
Boulder City

State of Arizona

Honorable John Kyl, United States Senator

Honorable John McCain, United States Senator

Honorable Ed Pastor, United States Representative

Honorable Bob Stump, United States Representative

Honorable J.D. Hayworth, United States
Representative

Honorable Jeff Flake, United States Representative

Honorable Jane D. Hull, Governor

Mohave County

City of Bullhead City

City of Kingman

Arizona Game and Fish Department

State of Utah

Utah Department of Natural Resources

Libraries

California

Barstow
Long Beach
Needles
Northridge
San Bernardino

Nevada

Boulder City
Henderson
Las Vegas
Laughlin
Mesquite
Overton
Community College of Southern Nevada
University of Nevada Las Vegas

Arizona

Kingman
Arizona State University
University of Arizona

Utah

St. George

Lake Mead Concessioners

PUBLIC NOTIFICATION

Lake Mead National Recreation Area followed the NPS policies and procedures for public notification concerning this planning effort. Notices of availability were published in the *Federal Register* by both the National Park Service and the Environmental Protection Agency. Press releases or articles were published in all newspapers in regions surrounding Lake Mead National Recreation Area. These include the Las Vegas Review Journal, Las Vegas Sun, Moapa Valley Progress, Kingman Miner, Meadview News, Laughlin Times, Mohave Valley Daily News, and the Boulder City News.

Representatives of Lake Mead National Recreation Area were interviewed on all Las Vegas television stations as part of regional news casts and special interviews, and information was included on the CBS Face to Face program in Las Vegas and on the Morning Show in Laughlin. Most of these were shown multiple times as part of various news broadcasts. There were also letters to the editor published in many of the newspapers. In addition, the National Park Service provided supplemental press releases announcing the public meetings.

The outcome of the public involvement efforts generated over 10,000 comment letters, the most ever received in a planning effort at Lake Mead National Recreation Area. In summary, the National Park Service feels there was adequate public notification of the availability of the plan.

Appendixes
Appendixes

APPENDIX A: COMMERCIAL SERVICES PLAN

The National Park Service (NPS) balances the public need for services and the policy of noncommercialism of the parks. Historically, the concessions program has been based on [what is identified as necessary and appropriate to meet](#) visitor need, the agency's ability to satisfy those needs, the resource itself, and the carrying capacity.

Changing conditions and increasing pressure to meet visitor needs requires the National Park Service to adopt a strategy that balances these conditions and the purposes and values of the park unit. Providing a range of [necessary and appropriate](#) visitor services, while protecting valuable natural and cultural resources, requires periodic evaluations of existing management strategy. This commercial services plan is designed to meet this need.

COMMERCIAL/CONCESSIONS POLICY

It is the policy of the [Secretary of the Interior](#), as provided by law, to permit commercial activities in park areas. Development shall be limited to those necessary and appropriate for public use and enjoyment of the national park area in which they are located, and that are consistent to the highest practical degree with the preservation and conservation of the areas. Commercial activities are only conducted under carefully controlled safeguards against unregulated and indiscriminate use, so that heavy visitation will not unduly impair park values and resources. Concessions within park units should be viewed as a means of achieving management objectives of the park unit.

Legal Authority

All activities at Lake Mead National Recreation Area are governed by the National Park Service Organic Act of 1916 that created the National Park Service and the 1964 act that created the recreation area.

The legal authority to regulate commercial activities within Lake Mead National Recreation Area is found in the following:

16 U.S. Code (USC) Sections 1, 3a, and 20

36 Code of Federal Regulations (CFR) Part 5, Commercial and Private Operations

Public Law (PL) 105-391, *National Park Service Omnibus Park Management Act*

36 CFR Part 51, Concession Contracts and Permits

36 CFR Section 1.6(a)

The 1986 *Lake Mead Recreation Area General Management Plan* (NPS 1986), along with subsequent development concept plans (i.e., *Willow Beach Development Concept Plan*) and the lake management plan for Lake Mead National Recreation Area address the need to provide recreational opportunities while preserving and protecting the recreation area. This commercial services plan provides the overall direction to accomplish this and a screening process to ensure compliance with the *General Management Plan*, development concept plans, lake management plan, and other mandates for Lake Mead National Recreation Area.

The *Omnibus Park Management Act of 1998* (PL 105-391) was passed by Congress and signed into law November 13, 1998. Title IV of this act, the *National Park Service Concessions Management Improvement Act of 1998*, deals directly with the National Park Service concessions. This legislation supercedes the *Concessions*

Policy Act, which guided National Park Service management of concessions for the previous 30 years. The 1998 legislation incorporates much of the philosophy of the old law.

In addition, the 1998 legislation requires the Secretary of the Interior to exercise his/her authority in a manner consistent with a reasonable opportunity for the concessioner to make a profit. Thus, only economically feasible concession operations should be introduced.

The 1998 law also makes some significant changes. Under the *Concessions Policy Act*, all existing concessioners had a preferential right of renewal. Under PL 105-391, section 403, only outfitter and guide services, and small business operations with anticipated gross receipts under \$500,000, will be given a right of preference in renewal of contracts. The term of new contracts will be 5 to 10 years, with longer contracts up to 20 years issued only in special financial situations with approval from the director. Concession permits will be discontinued and a short form contract used in its place. Possessory interest has been renamed Leasehold Surrender Interest and redefined. Under the old law, all franchise fees paid by a concessioner were sent to the General Treasury. Under the 1998 law, all franchise fees stay with the National Park Service to be used for visitor service or resource protection projects. The park retains 80% of the fees collected, with the remainder used servicewide.

Another important provision of the 1998 law affects how incidental business permits / commercial use authorizations (CUAs) are managed. There is concern with incidental business permits because of the inability to limit the amount of activity, since limits could not be placed on the number of permits issued. However, the 1998 legislation allows for the limitation of the number of commercial use authorizations based on resource issues.

The National Park Service is writing regulations to implement the 1998 law and will implement the solution through the regulation development process. This process involves reviews by other government agencies and the public. Incidental business permits for existing services will continue to be issued on a yearly basis, unless a moratorium for planning or resource reasons has been imposed, or until the regulation process for commercial use authorizations is complete.

The NPS guidelines that are applicable to commercial services include, but are not necessarily limited to:

NPS-48, Concessions Guidelines

NPS-50, Loss Control Management Program Guideline

NPS-53, Special Park Uses

NPS-83, Public Health Management Guideline

NPS Management Policies, Chapter 10: Commercial Visitor Services

*Director's Order 48A: Concessions Management**

*Director's Order 48B: Commercial Use Authorizations**

(* Being developed as of November 2002; will replace NPS-48 upon finalization)

These guidelines, along with laws and policies (see the "Evaluation Criteria" section), standard contract language, and operating procedures, are used in managing commercial activities throughout the national park system.

THE COMPONENTS OF THE COMMERCIAL SERVICES PLAN FOR LAKE MEAD NATIONAL RECREATION AREA

This plan will help define the concessions program at Lake Mead National Recreation Area by addressing the commercial activities that, if [necessary and](#) appropriate, will be permitted under the Concessions Management program. The plan may be periodically reviewed to address changes in visitor needs, site conditions, management goals, or to make modifications to the list of approved services.

The plan will identify a range of visitor services that meet necessary visitor needs and that promote the park unit's "purpose and significance (values)." Also, by evaluating existing and proposed services for their potential to impact recreation area resources, better protection of natural, cultural, and scientific resources can be attained.

The business community will benefit from the plan by having criteria under which additional necessary and appropriate services will be considered.

Purpose and Significance Review

The purpose and significance statements for the *Strategic Plan* (NPS 2001) Lake Mead National Recreation Area set key values that were used as guides in the development of this plan. All commercial activities within Lake Mead National Recreation Area are reviewed to ensure that the operations are appropriate and necessary for the recreation area.

Need for the Commercial Services Plan

Since the early 1970s, annual visitation to Lake Mead National Recreation Area has increased, along with the overall need for commercial [visitor](#) services. To balance the increasing need for additional visitor services and preservation and protection of the natural and cultural environments, an overall guide to the management of commercial services is needed to assist with determinations that are necessary and appropriate.

The 1986 *Lake Mead National Recreation Area General Management Plan* does not address the management direction of commercial activities within the recreation area, but it offers guidelines to follow for the development of concession services. Existing policy requires that commercial facilities and services within the recreation area, necessary [and appropriate](#) for the visitor's use and enjoyment, are to be provided through use of concessions. [These facilities and services are for identified needs, which are not, nor can they be, met outside park boundaries.](#)

A development concept plan is the planning document that maps out the location of commercial operations and all associated facilities at the various marinas and development zones defined in the *General Management Plan*. The development concept plan sets limits on the development and establishes the number and type of facilities for the development. All current development concept plans have incorporated overall concepts of the *General Management Plan* and have undergone extensive public review and input through the development concept planning process.

Commercial and concessioner operations associated with the facilities authorized under existing development concept plans are considered necessary and appropriate for the public use and enjoyment of Lake Mead National Recreation Area. For the purposes of this plan, certain commercial services authorized by development concept plans will not be reevaluated, unless there are changes to the activity. These services are listed in "Table A-1: Concessioner Services and Facilities."

This plan will be used to evaluate the operational changes to existing incidental business permits to ensure they contain adequate conditions or stipulations that protect recreation area resources. New proposals will be evaluated based on the criteria listed in "Attachment A: Commercial Services Evaluation Rating Form."

TABLE A-1: CONCESSIONER SERVICES AND FACILITIES (2000)

Concessioner	Services and Facilities
Black Canyon / Willow Beach River Adventure	Motorized float trips, ¹ small store, boat rentals, boat gas.
Callville Bay Resort	Snack bar, lounge, store, marina/boat rentals, personal watercraft rentals, houseboat rentals, trailer village, showers/laundry, dry boat storage, auto/boat gas, boat repair.
Cottonwood Cove Resort	Cafe, motel, marina/boat rentals, personal watercraft rentals, houseboat rentals, store, auto/boat gas, showers/laundry, trailer village, dry boat storage, boat repair.
Echo Bay Resort	Restaurant/lounge, hotel, store, marina/boat rentals, houseboat rentals, trailer village, showers/laundry, auto/boat gas, dry boat storage, boat repair.
Lake Mead Ferry Service, Inc.	Scheduled and unscheduled tour boat service, charter boat service and water taxi service to and from Hoover Dam and other locations on Lake Mead. Scheduled personal watercraft tours in the Boulder Basin.
Lake Mead Resort	Restaurant, store, marina/boat rentals, personal watercraft rentals, motel, boat gas, dry boat storage, boat repair.
Lake Mohave Resort	Restaurant/lounge, store, motel, marina/boat rentals, personal watercraft rentals, houseboat rentals, trailer village, showers/laundry, auto/boat gas, dry boat storage, boat repair.
Lakeshore Trailer Village	Trailer village with long-term and transient sites, showers/laundry, recreational vehicle and boat storage.
Las Vegas Boat Harbor, Inc.	Restaurant/lounge, marina/boat rentals, personal watercraft rentals, store, auto/boat gas, dry boat storage, boat repair.
Overton Beach Resort	Snack bar, store, marina/boat rentals, personal watercraft rentals, moorings, auto/boat gas, trailer village , showers/laundry, dry boat storage.
Temple Bar Resort	Restaurant/lounge, store, motel, marina/boat rentals, personal watercraft rentals, trailer village, showers/laundry, auto/boat gas, dry boat storage, boat repair.

1. Concessioner does not have an exclusive right for services.

All currently offered concessions services, whether under a concession contract, concession permit, or other agreement, will be evaluated prior to renewal in accordance with applicable laws, national policies, directives, or regulations, as well as by the commercial services plan criteria.

Future changes in national policies regarding commercial activities within units of the National Park Service will be incorporated into this plan.

Purpose of the Plan

The purpose of this plan is to define the concessions program at Lake Mead National Recreation Area through the establishment of “desired future conditions.” It will provide protection of natural, cultural, and scientific resources through a review and evaluation process.

Finally, this plan supplements the visitor services program by providing useful information on the commercial and concession programs to the public and business community.

Desired Future Conditions

The desired future conditions are the goals of the National Park Service that incorporate the values found in the *General Management Plan* and that were derived from the purpose and significance statements for Lake Mead National Recreation Area. Management seeks to achieve these conditions by following the objectives outlined below.

Management of all commercial uses will provide an open process of proposal review, which promotes low impact activities, protects the recreation area resources, and when applicable and authorized by law, recovers the NPS costs to administer the program.

All commercial uses must be integrated with and utilize the surrounding environment in its natural state. Commercial activities should focus the attention of the visitor primarily on the cultural and natural resources of the area and on appropriate recreational activities. Commercial uses within Lake Mead National Recreation Area must complement recreational activities directed towards the purpose and goals of the park.

The recreational experience shall be enhanced by services that meet the needs of the visitor and provide a wide range of educational and recreational opportunities in a natural and safe environment.

Review and Update Process of the Commercial Services Plan

This document is subject to review every five years and may be amended at any time at the discretion of the superintendent.

EXISTING COMMERCIAL SERVICES PROGRAM

The commercial services program at Lake Mead National Recreation Area includes evaluating concessioner performance, approving rates charged by concessioners based on an analysis of comparable prices in the private sector, safety inspections, public health oversight, and responding to questions and concerns from the public and businesses. In addition, with a varying degree of assistance, it includes preparation of all contracts, permits, associated conditions and stipulations documents, operational oversight, and planning/development of concession facilities.

Concessions program management is performed full time by the concessions management staff. An effort is made to consult with other disciplines, including protection, resources management, interpretation, and maintenance staff, in monitoring use and resources as they relate to commercial activities. Inquiries about commercial activities are forwarded to the concessions management staff for review and administrative action. Final approval of commercial services remains with the Office of the Superintendent. Protection rangers are prepared to address violations of laws and regulations as necessary in the field.

The concessions management staff conducts the quarterly and annual [operational and contractual reviews](#) for concession contracts and is responsible for monitoring the concessioners' maintenance agreements and operating plans. The staff also monitors other commercial operators on a regular basis for compliance with conditions in their permits.

The concessions management staff has the primary responsibility of administering the commercial services program at the park level. They maintain a working relationship with commercial service operators, preparing documentation for rate reviews, park-specific contract language, and the annual reports. All commercial services-related correspondence is accomplished through this division. All incidental business permit / commercial use authorizations originate through this division and are coordinated with other appropriate park divisions. Special use permits, including filming permits, originate in the ranger division.

HISTORY OF THE COMMERCIAL SERVICES PROGRAM AT LAKE MEAD NATIONAL RECREATION AREA

Prior to the 1980s, the commercial services program at Lake Mead National Recreation Area was not well-defined. Contract language was less specific, and some issues, such as environmental compliance, were not addressed in any detail, if at all.

During the 1980s, many reforms and improvements were made to the program nationwide. For instance, development of national concessions guidelines gave park staff guidance and direction in the management of commercial operations in the parks. Concession [management](#) staffing at parks was increased and specialized training was provided to concession staff and park managers. In addition, regulations governing the contracting process were promulgated, and standard concession contract language was strengthened.

Since most concessions contracts at Lake Mead National Recreation Area were issued prior to the reforms, allowing terms up to 30 years, [most](#) have expired and were authorized a yearly extension. These contracts are gradually being phased-out; however, the process to execute new contracts has been slow, since two moratoriums have been placed on concessions contracting since 1989. The first moratorium was placed in 1989 so that reforms in the concessions program could be enacted prior to any new contracts being issued. The National Park Service was allowed to begin contracting again in 1995. In November 1998, another moratorium was placed on concessions contracting with the passage of PL 105-391, which includes new concession contracting legislation. This moratorium was lifted in 2000 and contract preparations are underway.

Lake Mead National Recreation Area began issuing commercial use licenses in 1981. These licenses authorized small nonconcession-operated businesses to provide a commercial service in the recreation area. Previously, incidental commercial operations had been authorized through special use permits. There is no reliable data as to how much commercial activity occurred prior to the commercial use license program.

Fishing and hunting guides, boat repair services, and SCUBA instruction were among the first group of commercial operators to be issued commercial use licenses. Guided canoe and kayak trips, along with wilderness trips, were authorized a few years later. The program branched out somewhat during the 1990s, as recreational activities became more diverse.

In 1995, NPS Standard Directive (SD) 95-10 changed the commercial use licenses to incidental business permits and added additional requirements to the administration of the program. The directive also placed the incidental business permit program under the Special Park Use program, which allows cost recovery for these permits under the authority granted in 31 USC 9701 and 16 USC 3a. The incidental business permit program is also authorized through 36 CFR 1.6(a), which states:

“ . . . the superintendent may issue a permit to authorize an otherwise prohibited or restricted activity or impose a public use limit. The activity authorized by a permit shall be consistent with applicable legislation, Federal regulations and administrative policies, and based upon a determination that public health and safety, environmental or scenic values, natural or cultural resources, scientific research, implementation of management responsibilities, proper allocation and use of facilities, or the avoidance of conflict among visitor use activities will not be adversely impacted.”

and Section 5.3, Business Operations:

“Engaging in or soliciting any business in park areas, except in accordance with the provisions of a permit, contract, or other written agreement with the United States, except as such may be specifically authorized under special regulations applicable to a park area, is prohibited.”

In 1998, PL 105-391 officially placed the incidental business permit program under the NPS concessions management program.

THE CONCESSIONS PROGRAM AND OTHER TYPES OF AUTHORIZATIONS AT LAKE MEAD NATIONAL RECREATION AREA

All commercial [visitor service](#) operations within Lake Mead National Recreation Area require some form of written authorization. Exceptions are as follows:

Vehicle tow services are not required to have a formal authorization from the National Park Service. The Interagency Communications Center calls these services on a rotational basis as needed.

Commercial providers of maintenance and improvements in long-term [visitor](#) trailer villages and vacation cabin sites are not required to obtain a commercial authorization. However, specific requirements for these entities, which must be strictly adhered to, are outlined in the Superintendent’s Compendium.

Vendors entering the park to provide a delivery specifically to a concession facility, concessioner employee, or NPS employee are not required formal authorization. All other vendors must have a formal written authorization.

As of March 2002, there were 11 concession contracts and 125 authorized incidental business permits. The differences between the concession contract and other types of authorizations are summarized below. Table A-2 outlines the components of the different authorizations.

The Concession Contract

Concession contracts are agreement(s) between the [Secretary of the Interior](#), or authorized delegate, and a concessioner, whereby the concessioner is required to provide certain visitor accommodations, facilities, or services within a park unit under administration of the secretary. The secretary authorizes concessions operations by both contracts and permits. Concession contracts are issued via a competitive bid [process, which evaluates responses to a public notice of an available business opportunity](#).

To comply with the *National Parks Omnibus Management Act of 1998*, all concession operations authorized under contract with the National Park Service must be approved and authorized by the National Park Service under appropriate levels of delegation of authority through the preparation of a “Prospectus” (Solicitation of Offers), review of proposal, selection of the best offer, and execution of the contract with the selected party. The authorizing procedures are contained within 36 CFR 51.

The United States, in turn, provides adequate protection against loss of investment in structures, fixtures, improvements, equipment, supplies, and other tangible property provided by the concessioner under the terms of the contract.

Under the terms and conditions of a concession contract, the secretary has authority to assign for use, by the concessioner during the term of the contract, certain parcels of land and government improvements (facilities) appropriate and necessary to conduct operations. The final contract also requires the concessioner to fulfill certain obligations defined in the contract.

TABLE A-2: TYPES OF AUTHORIZATIONS
DRAFT (SOME ISSUES PENDING FINAL REGULATIONS)

	<u>Contracts</u>	<u>Commercial Use Authorizations</u>
	Concession Contract	Incidental Business Permit
Authority	79 Stat 969 16 USC 20	39 Stat 535 16 USC 1 and 3a 36 CFR 5.3
Term	Up to 10 years ¹	Up to two years
Solicited proposal	Yes	No
Requires services	Yes	No
Authorizes services	Yes	Yes
Services allowed to operate within area	Yes	Yes
Construction allowed	Yes	No
Compensation for investment	Yes	No
Right of preference outfitters and in renewal ²	Guide service only	No
Preferential right ³	Yes	No
Assigned, amended, or extended	Yes	No
Assigned lands or facilities	Yes	No
Fees	Yes, franchise fee	Yes, application administration monitor
Financial reports	Yes	Yes
<p>1. A contract may be awarded for more than 10 years if it has been determined that the contract terms and conditions warrant a longer period.</p> <p>2. Granted by law, not by contract or permit.</p> <p>3. Applies to some current/existing concession contracts only and may not apply to future/new concessions contracts, except in specific circumstances, as determined by the National Park Service.</p>		

Existing Lake Mead National Recreation Area concessions contracts authorize the following:

“Preferential Rights” contracts executed under PL 89-249 (former concessions law) provide concessioners with a preferential right to any new or additional services. New contracts will not grant this designation; specific areas and facilities will be assigned to a concessioner, with no exclusive or preferential right for new or additional services.

Concessioners pay the National Park Service franchise fees, a percentage of their gross receipts, as designated by their contract. The park retains 80% of the fees collected, with the remaining 20% used servicewide.

Services and construction are allowed within the park unit.

Authorization of land assignments and facilities.

Compensation for investments.

Contract can be assigned, amended, or extended.

Those “Lands and Government Improvement (Facilities)” provided to the current concessioners are described and identified in exhibits to the existing concessions contracts. The concessioner responsibilities for management of lands and improvements (facilities) are detailed in the “Operating and Maintenance Plans” for the contracts. These documents are available for review by the general public.

Under the terms of the concessions contracts, all concession operators within Lake Mead National Recreation Area are responsible for complying with all federal and state requirements on fuel lines and fuel storage tanks, as well as environmental restoration efforts.

The National Park Service Hazardous Waste Management and Pollution Prevention Team has developed a Spill Prevention Control and Countermeasures plan that provides recommendations and requirements to prevent environmental damage resulting from the oil spills. These plans are required by the Environmental Protection Agency as stated in 40 CFR, Part 112. In addition, the recreation area complies with state requirements and has developed Best Management Practices for Watercraft and Marina Operations, Dry Boat Storage, and Boat Repair Services. All marina operators, [boat repair companies and operators](#), and the National Park Service must comply with these requirements and best management practices.

Commercial Use Authorization. Commercial use authorizations will be defined further when regulations are written under PL 105-391. These commercial use authorizations are not considered concessions contracts. They authorize a private person, corporation, or other entity to provide [commercial](#) services to visitors at NPS units. The services provided must have minimal impact on the resources and values of the NPS unit and must be consistent with the purpose for which the unit was established, as well as with all applicable management plans and park policies and regulations. Protection of natural and cultural resources, maintaining public safety, and ensuring visitor enjoyment of the park are factors in the development of these authorizations. Monitoring the commercial activities is part of the commercial use authorization program. This helps to ensure business operations are conducted in a safe and equitable manner.

In order for an activity to be qualified as a commercial use authorization, it must meet **ONE** of the following criteria:

[Commercial operations not exceeding annual gross receipts of \\$25,000 resulting from services originating and provided wholly within the recreation area](#) (any operation grossing above this amount must be issued a concessions contract), or

[Commercial operations](#) originate and terminate outside of the boundaries of the recreation area.

Service is provided by organized children's camps, outdoor clubs, and nonprofit institutions (including backcountry use) (this will be interpreted/explained further upon the implementation of regulations).

Unlike the previous commercial use licenses and incidental business permits program, the National Park Service has the authority to limit the number of commercial use authorizations issued for the purpose of resource protection. When considering new commercial use authorization proposals, the National Park Service will determine if the approval of such service shall be limited to a specified number of authorizations for the purposes of resource protection.

The authorizations include the following conditions:

Payment of a reasonable fee for issuance to be used to recover associated management and administrative costs.

Term may not exceed two years.

No preferential right of renewal is provided.

Incidental Business Permits. The incidental business permit replaced the commercial use license in 1995 as part of an NPS revision to the concessions program under the authority of 36 CFR 1.6(a), 16 USC 3a, and SD 95-10. The incidental business permits are issued to businesses that do all aspects of their operation outside the park area with the exception of the activity itself.

The National Park Service is authorized by the *Cost Recovery Act*, as well as PL 105-391, to collect all costs associated with incidental business permits. The dollar amount charged is determined by application, administrative, and monitoring costs. Application costs start accruing with the request for the use of park resources and end with mailing the application form. Administrative costs accrue when the completed application form is received and include all correspondence, phone calls, meetings, and other administrative activities that occur during the life of the permit. Monitoring costs accrue when the permittee arrives in the park to perform the permitted use and end when the permitted use is over and the permittee leaves the area. Costs can be determined by using average costs derived from historic records.

Incidental business permits are issued noncompetitively for a term up to two years; all first-time incidental business permits are issued for one year. All business transactions, sales, and advertisements have to be conducted outside the park. No use of facilities is authorized in the park in association with the business or operations. Operational terms and conditions are set as necessary to establish commercial use levels and to protect park resources. Commercial operators wishing to operate in an area assigned to a concessioner must obtain a waiver from the affected concessioner prior to the National Park Service issuing a permit.

Special Use Permits. Special events may be authorized by the superintendent, subject to the same criteria as other special park uses, provided there is a meaningful association between the purpose of the park and the event, and the event contributes to visitor understanding of the significance of the park.

A superintendent may approve a request for a special event if it is determined that

- it will not conflict with law or policy
- it will not be a derogation of the values and purposes for which the park was established
- it is consistent with the park's enabling legislation
- it does not have reasonable potential to cause illness, personal injury, or property damage
- it will not unduly interfere with normal park operations, resource protection, or visitor use

The National Park Service will not permit the staging of special events that are conducted primarily for the material or financial benefit of participants or that involve commercialization, advertising, or publicity by participants. Events for which a separate public admission fee is to be charged, unless the event is directly related to the purposes for which the park was established, will not be permitted. In addition, the National Park Service will not sponsor or issue permits for special events conducted in wilderness areas if those events might be inconsistent with the protection of wilderness resources and values.

The National Park Service will recover costs incurred in administering permits and monitoring the activities it authorizes. It will also establish and collect permit fees authorized by applicable legislation, regulations, and policies.

Special use permits are not covered by the 1998 NPS concession legislation. Separate regulations for the management of special use permits can be found in 36 CFR 1.6. Guidelines for the issuance of special use permits are provided by NPS-53. The guidelines include NPS policy and instructions regarding commercial filming and photography, special events, and use and occupancy permits.

Commercial Film Permits. It is the policy of the National Park Service (NPS-21) to allow commercial filming and photography when it is consistent with the protection and public enjoyment of park resources. The regulations used to manage commercial filming are contained in 36 CFR 5.5. The National Park Service has the authority and responsibility to manage, permit, or deny filming projects consistent with the following principles:

Natural, cultural, wilderness, and recreational resources will be protected.

Activity will not unduly conflict with the public's normal use and enjoyment of a park.

Visitors using cameras or other recording devices for their own personal use are generally exempt from film permit requirements.

Coverage of breaking news never requires a permit, but it is subject to the imposition of restrictions and conditions necessary to protect park resources and public health and safety, and to prevent derogation of park values.

The National Park Service will not censor the content of any project, nor require finished film products for review, files, or documentation purposes.

Commercial filming programs in parks are usually managed as a special park use with full cost recovery. Applicants reimburse the park for all costs related to meetings, location scouting, development of permit stipulations, and onsite monitoring of film projects. Each film project usually has a unique set of conditions developed to ensure that park resources are protected and that other park visitors are not impacted by filming activities.

Cooperating Associations. Congress authorized cooperating associations in 1946. Their mission is to support park interpretive and scientific activities through proceeds from sales of educational and interpretive materials in a park, which is a commercial activity. They are usually assigned space in a visitor center or other visitor contact facility. Cooperating associations are authorized by a cooperative agreement. They are managed by NPS-32, a servicewide set of criteria and policies.

Under an agreement between the National Park Service and Southwest Parks and Monuments Association, signed on December 17, 1999, Southwest Parks and Monuments Association functions as a cooperating association in Lake Mead National Recreation Area. It is incorporated as a nonprofit organization for the purpose of providing support and assistance to the interpretive education and research activities of the National Park Service and to provide interpretive and educational services to the visiting public.

The association assists in the sale of materials of interpretive, educational, and thematic value that are approved by the National Park Service. It may sell only approved items that do not violate the conservation principles of the Park Service. Southwest Parks and Monuments Association can be granted a concession permit authorizing the sale of visitor convenience items. In locations where no concessioner or other commercial outlet is readily available, the association may be permitted to offer convenience and related merchandise, as long as such items are covered under a concession permit and are requested by the National Park Service. When operating under a concession permit, Southwest Parks and Monuments Association shall relinquish any preferential right to renewal of the permit(s).

Sale of items takes place in the Alan Bible Visitor Center, off Highway 93, four miles northeast of Boulder City, Nevada; at the Katherine Ranger Station, Bullhead City, Arizona; and at information stations at Las Vegas Bay, Temple Bar, and Cottonwood Cove during regular hours of operation.

REVIEW PROCESS

When a request for a new commercial service is made, an evaluation is performed to determine whether or not it is necessary and appropriate to permit such a service within Lake Mead National Recreation Area. This determination is made using the Commercial Services Evaluation Rating Form (attachment A). The evaluation process is multidisciplinary and the form is set up to automatically identify those services that are not “necessary and appropriate” within Lake Mead National Recreation Area. An explanation of the terms “necessary” and “appropriate” as they are used in this evaluation process can be found in the “Definitions” section (attachment B).

If it is determined that a service is necessary and appropriate, an application form and associated documents are sent to the applicant. Once the application and permit documents with the required application fee are returned, the multidisciplinary review or screening process begins.

The initial review — Upon review of the completed application and supporting documents, a decision is made as to which type of authorization is appropriate. The types of authorizations are concession contract or commercial use authorization (incidental business permit).

Evaluation screening process — The next step in the screening process is a review of the proposal for compliance with existing management policies (values and purposes), using the evaluation form (attachment A). The form is used to determine whether a visitor service is necessary and appropriate. Following the evaluation process, the superintendent makes a decision on the merit of the proposal.

The criteria used in the evaluation process are defined in the section titled “Evaluation Criteria and Definitions.”

All applicable laws and regulations, resource protection measures, and applicable planning and management documents are reviewed in relation to the proposal.

The level of environmental compliance necessary for the activity will also be considered in the review. In addition, an opportunity for public participation in management decisions affecting Lake Mead National Recreation Area is required under the *National Environmental Policy Act of 1969* (NEPA) and *National Historic Preservation Act of 1966*.

The NEPA process is an analysis of expected impacts from the proposed activity, where applicable, and development of mitigation measures to protect the human environment. The mitigation also forms the basis of stipulations or conditions used in the permit.

Commercial use authorization applications being renewed, or those identical (or nearly so) to an approved activity, will not go through the screening process again. However, if there are notable changes to an activity already approved in the commercial services plan, or if some aspects of an activity were not previously addressed in the initial screening and environmental clearance, then some level of additional review and NEPA compliance may be required.

Proposals are reviewed by the National Park Service against each of the “evaluation criterion” defined in “Evaluation Criteria and Definitions.”

Decision and notification — The decision to approve or reject a proposal is based on the evaluation process and the final determination by the superintendent. There are four possible decisions: (1) approval, (2) conditional approval, (3) disapproval, and (4) resubmit for additional information or analysis. Proposals that require environmental and other clearances (i.e., *National Environmental Policy Act*, *Archeological Resources Protection Act*, *Endangered Species Act*, *Clean Water Act*) may result in the National Park Service charging the applicant to recover government costs.

In cases where an environmental clearance needs to be completed prior to the National Park Service authorizing the service or concession, an environmental assessment or environmental impact statement will be prepared. The document used will be determined by the National Park Service.

Examples of an evaluation form (decision document) (attachment A), a permit application form (attachment C), and a table delineating how fees are derived (attachment D) are provided in this appendix.

The development of mitigation measures or stipulations and permit conditions will come from completion of the environmental document, from existing information obtained by monitoring past activities, and from recommendations of technical specialists.

After all applicable fees have been paid, an acceptance letter or notification and the completed permit will be sent to the applicant for signature. The applicant must return the signed permit, comply with any permit conditions, and show proof of liability insurance coverage prior to the superintendent authorizing the commercial activity.

Plan updates and changes to the existing list of authorized services will be initiated by the National Park Service as the need arises. Initially, the period of review of services may be initiated every two or three years. However, the superintendent may delay or initiate an update at his/her discretion.

EVALUATION CRITERIA AND DEFINITIONS

The Commercial Services Evaluation Rating Form (attachment A) will be used to evaluate all authorized commercial operations and future commercial proposals within Lake Mead National Recreation Area. The criteria definitions form the basis of the screening process and are derived from a review of existing laws and regulations, the U.S. Department of the Interior and NPS policies, Lake Mead National Recreation Area management plans, and scientific studies.

Upon receipt of a proposal for a new commercial visitor service, the concessions management office will perform an initial review to determine if the activity should be denied or sent on for further review. If further review is needed, each division in the recreation area is assigned criteria under which to rate the application. Some criteria will be rated by more than one division. For example, every division must determine whether or not approval of the proposed activity will cause the need for additional staffing or funding.

The following criteria is listed in the order it appears on the evaluation rating form and an explanation of how each criterion applies to the review process is provided.

Infringements Upon Concession Contracts

Evaluated by concessions management staff.

The evaluation will be used to identify which type of authorization is appropriate for the proposal, or if there are conflicts with a required service provided by a concessioner under a concession contract.

The following regulations, guidelines, and laws will be used to evaluate new proposals for compliance with existing concessions policy:

Laws/Regulations

PL 105-391, Section IV, *National Park Service Concessions Management Improvement Act of 1998*

PL 88-639, Lake Mead National Recreation Area Enabling Legislation

16 USC Sections 1, 3a, and 20

APPENDIXES

36 CFR Section 2.22, Property
36 CFR Section 2.52, Sale or Distribution of Printed Material
36 CFR Section 2.61, Residing on Federal lands
36 CFR Part 5, Commercial and Private Operations
36 CFR Part 51, Concession Contracts and Permits
36 CFR Section 7.48, Lake Mead National Recreation Area
U.S. Public Health Service, Food and Drug Administration Food Code; “Current Edition”
Americans with Disabilities Act of 1990

Other

NPS-48: Concessions Guideline
NPS-50: Loss Control Management Program Guideline
DO-53: Special Park Use Guideline
NPS-83: Public Health Management Guideline
SD 95-10: Incidental Business Permit
Lake Mead National Recreation Area General Management Plan (1986)
Lake Mead National Recreation Area Lake Management Plan
Lake Mead National Recreation Area Superintendent’s Compendium
Other management plans
State and local laws, regulations, policies, and guidelines
Spill Prevention Control and Countermeasures plan
Best Management Practices for Watercraft and Marina Operations, Dry Boat Storage, and Boat Repair Services
Director’s Order #77-7: Integrated Pest Management
[Executive Order 13101, *Greening the Government Through Waste Prevention, Recycling, and Federal Acquisition* \(September 14, 1998\)](#)
[Executive Order 13123, *Greening the Government Through Efficient Energy Management* \(June 3, 1999\).](#)
[Executive Order 13148, *Greening the Government Through Leadership in Environmental Management* \(April 21, 2000\)](#)
[Executive Order 13149, *Greening the Government Through Federal Fleet and Transportation* \(April 21, 2000\)](#)

For commercial use authorizations, the proposed service will be reviewed to ensure compliance with current policy. Similar proposals for existing services will be approved.

All written proposals for commercial use authorizations must also be evaluated for any conflict with the terms and conditions of the existing concessions authorizations. New or additional applications for accommodations or services will be reviewed to ensure compliance with the existing concession contracts or permits. Within a concessioner’s assigned area, a commercial use authorization or other authorization will not be issued unless a written waiver of interest is received from the applicable concessioner and all required criteria are met.

Public Health and Safety Issue

Evaluated by concessions management, visitor protection, maintenance staff, and safety officer.

Public safety is an ongoing concern at Lake Mead National Recreation Area and promoting health and safety is a high priority. All proposals should incorporate safety measures to promote a safe visitor experience.

Included in this criterion is a determination as to whether or not the Food and Drug Administration food code applies to the proposed operation.

A secondary goal of this criterion is to reduce the amount of time and money the National Park Service spends on medical emergencies and search and rescue operations.

Appropriate Use of Land and Water

Evaluated by concessions management and visitor protection staff.

The 1986 *General Management Plan* divided the recreation area into four land use zones. The 2002 *Lake Management Plan*, addresses the water use zones and criteria and guidelines defining which land/water use activities are allowed. These guidelines are used to determine if a proposed action is consistent with authorized uses within the zone, if the proposed activity is within development constraints, and that the activity complements the management strategy for the particular zone.

Park Purpose and Significance

Evaluated by concessions management, visitor protection, and planning staff.

The purpose statement is based on the enabling legislation for Lake Mead National Recreation Area. The statement reaffirms the reasons why Lake Mead National Recreation Area was established and included as part of the National Park Service, the foundation for management decisions and planning efforts.

The significance statement captures the essence of Lake Mead National Recreation Area's importance to our country's natural and cultural heritage. It also describes the recreation area's distinctiveness and helps place the park in its regional, national, and international contexts. The significance statement also helps managers make decisions that preserve the resources and values necessary to accomplish Lake Mead National Recreation Area's purposes.

All proposals will be evaluated against the purpose and significance statements. The proposal should support or enhance these values, while complying with the intent of the "desired future conditions" discussed in this plan.

Management Plans

Evaluated by concessions management, resource management, and planning staff.

Appropriate land and water management plans will be reviewed to assist in the determination of the operations and conditions that would be allowed in a particular area of Lake Mead National Recreation Area. Examples of some of the management plans and studies include, but are not limited to the following:

General Management Plan

Development Concept Plan

Resource Management Plan

Lake Management Plan

Concessioner Land Assignment and Facilities

Evaluated by concessions management staff.

Facilities (to include all land developments) are not authorized for incidental business permits. They are typically authorized for concession contracts. Where facilities are needed for the business to operate, a determination will be made on which type of concessions authorization is applicable, if any. Final approval will depend on the assessment of “benefit to the park” and “appropriateness” for Lake Mead National Recreation Area.

If a proposed operation falls within the land or facility assignment of a concessioner, an authorization will not be granted unless a written waiver of interest is received from the applicable concessioner.

Additional National Park Service Staffing Needs and Funding

Evaluated by all divisions.

Upon receipt of a proposal, each division will consider its staffing and funding impacts if the proposal is approved. If an activity requires additional NPS staffing or funding to administer and monitor the operation, the activity may either be denied or the additional costs incurred will be recovered from the operator.

The process of monitoring individual commercial use authorizations and concession contracts will be examined to determine staff capabilities in administering the proposed activity. The amount of staff time spent on the operation is, in many aspects, dictated by the complexity of the operation as detailed in the work plan submittal. For the purposes of determining the amount of staff time related to the processing of an application, the approval/rejection and evaluation process, and subsequent authorization and monitoring requirements for the operation/service, the following two categories of “complexity of operations” will apply:

High Complexity — A commercial service will be placed in this category for one or more of the following reasons:

- an elevated level of monitoring may be required for the service
- a higher possibility of negative impact on natural resources exists
- greater potential for hazardous material contamination is present
- greater potential for visitor protection response is a factor in the service (i.e., safety issues, emergency medical service responses, and potential search and rescues)

Examples of these services include, but are not limited to:

- boat repair (all)
- canoe/raft delivery, retrieval, instruction, and guiding
- marine salvage
- motorized vehicle tours
- SCUBA instruction and charters
- waterski instruction
- wilderness trips

Low Complexity — A commercial service will be placed in this category if none of the above criteria are involved, there is no anticipated need for a high level of monitoring, and/or it entails a very short operating season.

Examples of these services include, but are not limited to:

- boat brokers, marine appraisers, marine surveyors
- boat detailing (wash and interior only – no sandblasting, scraping, or chipping)
- boat haulers (delivery/launch/retrieval)
- boat lift installation and repair
- fishing and hunting guides
- radio marine band installation
- satellite dish installation and repair
- trailer village appraisers
- upholstery/canvas repair and installation
- vehicle shuttle service

Services that fall in the high complexity category will be charged a higher authorization fee in order to recover the additional costs of monitoring these services.

Violation of Law and Policy

Evaluated by concessions management and visitor protection staff.

Federal, state, and local laws, rules, codes, and regulations will be reviewed to determine if the activity is legal and in compliance with law and NPS policies related to that activity. Any violation or conflict with a law or regulation is reason for denial of the proposal or application.

Violation of Closure Notice

Evaluated by visitor protection staff.

Closure notices delineate areas that are either closed to the public or closed for certain activities. They are issued by the visitor protection staff. Each proposal will be reviewed to ensure that the area in which the activity will take place does not violate any closure notices.

Visitor Use Conflicts

Evaluated by visitor protection, interpretation, planning, and maintenance staff.

Conflicts can arise where noncommercial and commercial activities clash. As the carrying capacity for Lake Mead National Recreation Area approaches, more emphasis will be needed on the zoning of appropriate use. The

maintenance of solitude and the promotion of a primitive recreational setting will need to be balanced with the increasing need for service and visitor expectations.

Conflicts between proposed commercial activities and noncommercial visitor uses will be decided in favor of the noncommercial use. The commercial activity must support the “greater need” of the visitor and park unit and not specifically the short-term profit and resource exploitation.

Impact on National Park Service Visitor Facilities

Evaluated by visitor protection, interpretation, and maintenance staff.

If the proposal includes the use of NPS visitor facilities, it will be reviewed to determine if such use is appropriate for the specified facility and to ensure that the use does not conflict with National Park Service programs and visitor services offered at the facility.

Public Need and Demand

Evaluated by visitor protection, interpretation, planning, and maintenance staff.

Proposals will be evaluated based on whether there is a visitor or recreation area need for the commercial service. Visitor need is determined through visitor surveys, letters, and past experience with issues relating to the visitor experience. Generally, services that are readily available immediately outside the park boundaries are not approved.

Lake Mead National Recreation Area determines the need for a service based on management policies, legislation, the *General Management Plan*, the *Lake Management Plan*, park purpose and significance, and existing management plans. The desired future conditions expressed in this plan will play an important role in determining the need for a service.

Impacts on Sensitive Habitat

Evaluated by resource management staff.

Habitat is the locality, site, and particular type of local environment occupied by an organism (both physical and biological factors). Sensitive habitat is defined in this plan as “habitat utilized by an animal or plant species (or a group of species) that is either rare, unique, or restricted in local distribution, or is listed as a critical habitat by the U.S. Fish and Wildlife Service under the *Endangered Species Act*.” Some sensitive habitat areas may be closed to public use during some or all of the year.

Sensitive habitat is also considered as any natural habitat, outside of developed zones, that may be grossly changed or altered by human activity, such that the natural plant or animal community can no longer exist in the location.

Proposals will be evaluated to ensure the activity is in compliance with applicable recovery plans, management policies, and future resource management direction.

Impacts on Cultural Resources

Evaluated by resource management staff.

Cultural resources are defined as “the remains of past human activity” that have the “potential to describe and explain human behavior” (NPS-28). The presence of numerous cultural resources lends significance to the purpose of setting aside lands within Lake Mead National Recreation Area for the public trust. Cultural resources occur in many of the designated lake management zones; therefore, all proposed commercial activities, regardless of location, will be evaluated based on their impact to these fragile, nonrenewable resources.

Impacts on Paleontological Resources

Evaluated by resource management staff.

These fossilized remains from plants and animals are associated with the park geology. Although these nonrenewable resources are rare and have not been inventoried, they are found in various locations around the park. Therefore, all proposed commercial activities, regardless of location, will be evaluated as to their potential to impact paleontological resources.

Impacts on Natural Resources

Vegetation. Evaluated by resource management staff.

Existing vegetation surveys will be consulted or a survey will be conducted as part of the proposal review, when applicable. The information will assist in the determination of the potential effects of the proposed activity on the vegetative community. Plant community characteristics will be reviewed to determine compatibility with the proposed use(s) and to ascertain the vegetation type, its health/vigor, and its potential to sustain use. We are striving to maintain or increase certain plant types and communities, soil cover, and overall ecosystems productivity. A healthy plant community helps to minimize soil erosion and provide needed wildlife and natural habitat.

The following criteria will be used to assess all proposed operations:

Plant community or vegetation type — The uniqueness of the plant community is considered in evaluating how the activity may affect vegetation. If the activity will occur within a vegetation type that is extremely rare within Lake Mead National Recreation Area, the activity may not be appropriate if it will cause significant change. On the other hand, if it will occur in a common vegetation type, the impacts that may occur would be less significant.

Changes to community structure — The effect of a proposal on general community structure must be evaluated both in regard to the effect on the overall plant community and on visitor perception of the aesthetics. A proposed activity may be of concern if it will directly remove a significant amount of vegetation in a pronounced or obvious pattern. Such patterns are especially objectionable if the aesthetics or visitor perception of health of the plant community is degraded. For example, certain uses may cause multiple trails to be created within a zone that would be visible and considered unsightly to the public. Factors considered in relationship to change in community structure include trampling/compaction of substrate, changes in nutrient uptake, and pollutants.

Threatened/Endangered or rare plant species — The impact to any special status plant or animal species must be considered in evaluating a potential commercial activity. If an activity will directly affect any such species, the project should be either denied or a mitigation proposal included in the permit to ensure protection. In most cases, a specific survey will be necessary to identify if any of the species of concern are located in the area of proposed use.

Soils. Evaluated by resource management staff.

An order III soil survey has been completed for Lake Mead National Recreation Area. The survey will be consulted to determine what affects site conditions (soils) could have on the proposed activity. Soil characteristics will be reviewed to determine compatibility with the proposed use(s) and to ascertain the soil erosion potential (where appropriate) in the area of the activity. Lake Mead National Recreation Area is striving to maintain or increase soil productivity within applicable areas, to minimize soil erosion due to human disturbance, and to prevent pollution of this resource.

Water Quality. Evaluated by resource management staff.

Water quality is of prime concern due to its potential to affect human health and aquatic biota. Water quality standards for recreational waters, have been developed for Arizona waters within Lake Mead National Recreation Area. These standards, although not formally adopted by the state of Nevada, provide for the general management of recreational waters. All proposals will be reviewed to ensure compliance with these standards. There may be circumstances where impacts may still be unacceptable, even though the standards are not expected to be exceeded. This could occur in certain areas with little human influence where pristine conditions exist and natural water systems remain.

Some of the factors being considered in assessing a proposed activity include:

- uniqueness of the water resource with Lake Mead National Recreation Area
- existing water quality and expected change (with proposed mitigation)
- type of pollutants and potential for affecting water quality
- updates of the state's water quality standards
- potential impairment or degradation of water quality

Air Quality. Evaluated by resource management staff.

The air quality standards set forth with the *Clean Air Act* (42 USC 7401-7671q, as amended in 1990) must be maintained. Lake Mead National Recreation Area is designated a class II area under this law. A class II airshed is defined as an area having moderate to good air quality, with "some deterioration in quality resulting from moderate, well-controlled growth." Commercial activities will be reviewed to determine what impact to air quality standards, if any, would occur as a result of the activity.

Direct impact of chemical pollutants — Any project that will emit air pollutants, including dust, must be evaluated to determine if the levels exceed the standards set forth in the *Clean Air Act*. All operations are required to be in compliance with state air quality standards for protection of public and environmental safety.

Further, it is important to determine if concentrated pollutants would interfere or affect visitor use and enjoyment of the park or the surrounding areas. This potential effect will be considered even if state pollutant levels are not exceeded. The concern relates to tangible impacts to smell, taste, noise, and overall park visibility issues.

Impacts on Solitude

Evaluated by resource management staff.

Solitude is defined as "the quality or state of being alone or remote from others; or a lonely or secluded place." Solitude lends significance to the purpose of setting aside lands within Lake Mead National Recreation Area for

the public trust. While the degree of natural quiet can be expected to vary, depending on the zone in which an activity is carried out, proposed commercial ventures will be evaluated with the intent of retaining relative solitude as appropriate for each zone.

Impacts on Scenic Quality

Evaluated by resource management staff.

Scenic quality can be generally defined as the caliber of the setting or view. Scenic quality can include long-range, unobstructed viewsheds, pristine riparian areas, intact historical sites, clarity of water and night skies, and natural quiet. Scenic quality is one of the purposes for setting aside lands within Lake Mead National Recreation Area. Regardless of the location, scenic quality can be marred by temporary or permanent installations of facilities, air pollutants, vandalism, and activities that temporarily distort or disturb the view. Therefore, all proposed commercial activities will be evaluated based on their impact on the scenic quality of the area.

Impacts on Waste Reduction Programs

Evaluated by resource management and maintenance staff.

Executive Order 12856 was signed in August 1993 and calls for all federal agencies to reduce by 50% the amount of toxic chemicals or hazardous materials used, purchased, or stored at government facilities. To comply with this mandate, Lake Mead National Recreation Area has instituted a program to limit all use of environmentally “unfriendly” products, practices, and purchases. Current management policy recommends and, in some cases, requires all products used in the course of a business or recreation practice to be environmentally friendly.

“Environmentally friendly” material is defined as those products that are “nonpolluting, nonhazardous to the environment, safe for public use/exposure, biodegradable, recyclable, and economically viable.” Practices that are environmentally friendly include nonpolluting, nonland disturbing, and low impact uses.

The potential for long-term concentrations of pollutants will also be assessed. Various laws and regulations will be reviewed to assist in determining what environmentally friendly products are available.

Conflict with Interpretive Programs

Evaluated by interpretive staff.

The evaluation process will review any narrative presentation for accuracy. Safety and preservation messages are encouraged (i.e., importance of litter pickup, staying on trails to protect the fragile desert ecosystem), as well as acknowledgement that the tour/trip is taking place within Lake Mead National Recreation Area, a unit of the National Park Service. Tour/trip locations will also be evaluated to ensure that no conflicts exist with official National Park Service programs.

Carrying Capacity

Evaluated by planning staff.

The *Lake Management Plan* for Lake Mead National Recreation Area defines use limitations for both Lakes Mead and Mohave. The purpose of the carrying capacity component of the *Lake Management Plan* was to

identify the criteria that were utilized in setting the boating capacities and providing the public an opportunity to review and comment.

The resource criteria in this plan will help define the overall carrying capacity for all land-based commercial activities until a more specific survey is conducted for the entire recreation area.

The evaluation process will consider the following objectives to meet desired future conditions:

- Optimize the diversity of appropriate recreational activities on the lakes.

- Promote boating and visitor safety.

- Manage crowding and conflict in problem locations to improve visitor satisfaction.

- Improve shoreline litter and sanitation conditions.

- Reduce shoreline camping conflicts.

- Protect natural and cultural resources.

- Protect water quality.

These management objectives represent most of the key ideas to preserve the visitor experience under ever increasing visitation and use of the recreation area. They were developed through a public input and review process that took place in 1986 and resulted in the completion of the *General Management Plan*.

RESTRICTED USE AREAS

Certain areas within Lake Mead National Recreation Area are restricted from commercial use to protect and preserve the delicate resources in these areas or to promote visitor health and safety. Generally, such restrictions are defined in the park management plans. Specific restrictions include:

- No commercial activity is authorized in the Newberry Mountains area, which includes Grapevine Canyon, Spirit Mountain, and Christmas Tree Pass, located in the southern section of the park on the Nevada side of Lake Mohave. This area is designated as an environmental protection zone and is listed as a Traditional Cultural Property on the National Register of Historic Places. This area is managed for protection, preservation, interpretation, and restoration of its natural and cultural resources.

REFERENCES

PUBLIC STATUTES, LAWS, ACTS, AND CODES

Archeological Resources Protection Act of 1979 (ARPA). *U.S. Code*. Vol. 16, secs. 470aa–470mm, *U.S. Public Law* 96-95.

Clean Air Act of 1990 (as amended). *U.S. Code*. Vol. 42, secs. 7401–7671, *U.S. Public Law* 88-206.

Endangered Species Act of 1973 (ESA). *U.S. Code*. Vol. 16, sec. 1531 et seq., *U.S. Public Law* 93-205.

Federal Water Pollution Control Act (Clean Water Act) (as amended). *U.S. Code*. Vol. 33, secs. 1251–1387, *U.S. Public Law* 92-500, 95-217.

National Environmental Policy Act of 1969 (NEPA). *U.S. Code*. Vol. 42, secs. 4321–4370a.

National Historic Preservation Act of 1966. *U.S. Code*. Vol. 16, sec. 470-470x-6, *U.S. Public Law* 89-655.

National Park Service Organic Act of 1916. *U.S. Code*. Vol. 16, sec. 1.

Safe Drinking Water Act of 1946 (SDWA). *U.S. Code*. Vol. 42, sec. 300f-j-26.

U.S. Public Law 88-639. “Enabling Legislation,” Lake Mead National Recreation Area. 88th Cong., 653d sess., 8 October 1946.

U.S. Public Law 89-249. “Relating to the establishment of concession policies in the areas administered by National Park Service and for other purposes,” 89th Cong., 9 October 1965.

U.S. Public Law 105-391. “National Parks Omnibus Management Act of 1998.” “Title IV, National Park Service Concessions Management,” 105th Cong., 13 November 1998.

REFERENCES CITED

Public Health Service, Food and Drug Administration, U.S. Department of Health and Human Services

2001 “Food Code.” On file at Lake Mead National Recreation Area, Boulder City, NV.

National Park Service, U.S. Department of the Interior

1986 “Final Environmental Impact Statement General Management Plan, Lake Mead National Recreation Area.” On file at Lake Mead National Recreation Area, Boulder City, NV.

2001 “Lake Mead National Recreation Area Strategic Plan, 2000–2005.” On file at Lake Mead National Recreation Area, Boulder City, NV.

ATTACHMENT A

LAKE MEAD NATIONAL RECREATION AREA
COMMERCIAL SERVICES EVALUATION RATING FORM

Type of Service _____

Name of Applicant _____

The above applicant has requested authorization to provide a new commercial visitor service in the recreation area. A copy of the proposal is attached. Please evaluate the request based on the criteria noted in the applicable section of this form. (i.e., Concessions, Resource Management, Visitor Protection, Interpretation, Maintenance, Administration) Please return to the concessions management office by _____

Thank you!

CRITERIA COMMENTS	EVALUATION			
CONCESSIONS		**	*** DENY	Evaluator:
Infringements Upon Concession Contract?	NO		YES	
Public Health & Safety Issue?	NO	YES	YES	
Appropriate Use of Land/Water?	YES		NO	
Violation of Law/Policy? (if yes, list)	NO		YES	
Aligned with Park Purpose/Significance?	YES		NO	
Prohibited in Management Plans? (if yes, list)	NO		YES	
Within Concessioner Land Assignment/Facilities ?	NO	YES*	YES	
Additional NPS Staffing Needs/Funding? (please list)	NO	YES	YES	
Recommend Review by Administration?	YES	NO		
VISITOR PROTECTION			DENY	Evaluator:
Violation of Law/Policy? (if yes, list)	NO		YES	
Violation of Closure Notice?	NO		YES	
Public Health & Safety Issue?	NO	YES	YES	
Aligned with Park Purpose/Significance?	YES		NO	
Visitor Use Conflicts?	NO	YES	YES	
NPS Visitors Facilities Impacted?	NO	YES	YES	
Additional NPS Staffing Needs/Funding? (please list)	NO	YES	YES	

Appropriate Use of Land/Water?	YES		NO	
Public Need/Demand?	YES	NO	NO	
RESOURCE MANAGEMENT			DENY	Evaluator:
Prohibited in Management Plans? (if yes, list)	NO		YES	
Impact to Sensitive Habitat?	NO	YES	YES	
Impact to Cultural Resources?	NO	YES	YES	
Impact to Paleontological Resources?	NO	YES	YES	
Impact to Natural Resources?	NO	YES	YES	
Impact to Solitude?	NO	YES	YES	
Impact to Scenic Quality?	NO	YES	YES	
Additional NPS Staffing Needs/Funding? (please list)	NO	YES	YES	
Conflicts with Waste Reduction Programs? (hazardous materials, trash, etc.)	NO	YES	YES	
INTERPRETATION			DENY	Evaluator:
Conflict with interpretive programs?	NO	YES	YES	
Visitor Use Conflicts?	NO	YES	YES	
Public Need/Demand?	YES	NO	NO	
NPS Visitor Facilities Impacted?	NO	YES	YES	
Additional NPS Staffing Needs/Funding? (please list)	NO	YES	YES	
PLANNING			DENY	Evaluator:
Prohibited in Management Plans? (if yes, list)	NO		YES	
Carrying Capacity Exceeded?	NO		YES	
Visitor Use Conflicts?	NO	YES	YES	
Aligned with Park Purpose/Significance?	YES		NO	
Public Need/Demand?	YES	NO	NO	
Additional NPS Staffing Needs/Funding? (please list)	NO	YES	YES	
MAINTENANCE			DENY	Evaluator:
NPS/Visitor Facilities Impacted?	NO	YES	YES	
Visitor Use Conflicts?	NO	YES	YES	
Conflicts with Waste Reduction Programs? (hazardous materials, trash, etc.)	NO	YES	YES	
Is Requested Land/Water Surface Available?	YES		NO	

APPENDIXES

Public Need/Demand?	YES	NO	NO	
Additional NPS Staffing Needs/Funding? (please list)	NO	YES	YES	
ADMINISTRATION - see above (upon recommendation by concessions staff)			DENY	Evaluator:
Additional NPS Staffing Needs/Funding? (please list)	NO	YES	YES	

*Authorized only with waiver from affected concessioner.

**Items marked in this column imply that public health/safety and/or resource impact is minimal/sustainable; if you circle an item in this column please list the specific restrictions that need to be placed on the authorization to prevent unacceptable impact levels

***Any boxes checked in this column result in denial of the proposal without further review. The “yes” or “no” answers reference the questions at the beginning of the applicable row.

Please note any additional comments and concerns you may have below:

Conditional Recommendation		Additional Comments and Recommendations
Approved		
Disapproved		
Resubmit		
NEPA		
Other Issues		
Further Discussion Needed		

Superintendent

Date

ATTACHMENT B

DEFINITIONS

Appropriate — Compatible with the park’s natural, cultural, and/or recreational resource(s); recognizing the purpose of the established area.

Backcountry Trips — (formerly titled “wilderness trips”) Trips which are undertaken outside the developed areas and/or paved roads of the recreation area and may include use of approved backcountry roads or areas that are only accessible via boat or on foot. Special restrictions, which vary by area and activity, are usually applied to these trips.

Commercial Use Authorization (CUA) — An instrument used to authorize a private person, corporation, or other entity to provide services to visitors to units of the national park system. commercial use authorizations are not considered concession contracts. They may only be issued for terms of two years or less and must meet **ONE** of the following operations: 1) Commercial operations with annual gross receipts of not more than \$25,000 resulting from services originating and provided solely within a unit of the National Park Service; 2) The incidental use of resources of the park unit originating and terminating outside of the boundaries of the park unit; OR 3) Such uses by organized children's camps, outdoor clubs and nonprofit institutions (including backcountry use), and other such uses as determined appropriate. The number of commercial use authorizations can be limited for the purpose of preservation of park resources and values.

Compensation for Investments — A clause the United States may use in a concessions contract to provide adequate protection against loss of investment in structures, fixtures, improvements, equipment, supplies, and other tangible property provided by the concessioner under the terms of the contract (36 CFR 51.4).

Concession Contract — An agreement(s) between the director of the National Park Service and a concessioner whereby the concessioner agrees to provide certain visitor accommodations, facilities, or services within a park area under the administration of the director.

Evaluation Criteria — Criteria listed in the “Commercial Services Evaluation Rating Form” (attachment A) that are used to determine whether or not a proposed commercial visitor service will be approved within Lake Mead National Recreation Area. Individual criteria are further defined in the section titled “Review Process.”

Incidental Business Permit (IBP) — A commercial use authorization authorizes commercial activities occurring within the National Park Service unit. This permit requires: a) All business transactions, sales transactions, and advertisement must be conducted outside of the park unit; b) No aspects of the business, except for the service itself, can be conducted within the park; c) No facilities will be authorized in association with the business or operations; and d) The service provided must not conflict with any concession contract. The incidental business permit is administered under 36 CFR 5.3, and also falls under the purview of the *National Park Service Concessions Management Improvement Act of 1998* (Public Law 105–391).

Necessary — A visitor service or activity required to meet the needs of the visitor/public, which recognizes the purposes of the area and is not available immediately outside the recreation area.

Overnight — For this plan, it is defined as camping in a developed campground, or at locations authorized in the Superintendent’s Compendium. Vehicle camping is permitted only in designated camp areas. Backpack and horseback camping is not permitted within one-half mile of any designated roadway, except at designated campsites. Backcountry camping requires the use of a fire pan and human waste containment. All waste must be packed out. Private/Company vessels with sleeping accommodations are not authorized for use in overnight stays; however, concessioner houseboats may be rented for such purposes. Specific permit requirements may apply.

Preferential Right — Refers to an optional clause which may be included in concessions contracts executed prior to the enactment of the *National Park Service Concessions Management Improvement Act of 1998*. Such clause grants the concessioner a contractual right to provide new or additional visitor accommodations, facilities, and services of the same character as authorized under the concessioner's contract, if approved by the director of the National Park Service. Under the 1998 act, no exclusive rights may be granted in a concessions contract to provide all or certain types of visitor services in a park area.

Purpose and Significance — Statements that reaffirm the reasons why Lake Mead National Recreation Area was set aside as part of the National Park Service. They describe significant values of the National Park Service unit and provide the foundation for management decisions and planning efforts.

Right of Preference — Applies only to concessioners offering specialized backcountry outdoor recreation guide services which require the employment of specially trained and experienced guides. Refers to the right of such an existing satisfactory concessioner to a preference in the extension or renewal of its contract or a new contract. Right of preference shall not be granted for any other type of concession operation.

Staffing Needs — the level of staffing needs required is based on the following criteria:

Level of National Park Service staff involvement or onsite contact required

Level of monitoring and compliance enforcement required

Potential for natural or cultural resource impact

Potential for hazardous material contamination

Possibility of law enforcement and/or emergency medical service response

Length of operating season

Substantive — Belonging to the real nature or essential part of a thing; essential.

ATTACHMENT C

APPLICATION FOR INCIDENTAL BUSINESS PERMIT

**NATIONAL PARK SERVICE
LAKE MEAD NATIONAL RECREATION AREA**

NAME OF APPLICANT _____

BUSINESS NAME _____

ADDRESS _____

EMAIL	WEB PAGE

PHONE NUMBER **EMERGENCY PHONE NUMBER**

FAX NUMBER _____

TAX IDENTIFICATION (OR SOCIAL SECURITY) NUMBER: _____

TYPE OF ACTIVITY/SERVICE

LOCATION OF ACTIVITY/SERVICE WITHIN PARK

DESCRIPTION OF ACTIVITY/SERVICE[illegible]

Attach sheet of paper if more space is needed

SIGNATURE OF APPLICANT **DATE**

=====

Lake Mead National Recreation Area, Concessions Management Office
601 Nevada Hwy, Boulder City, Nevada 89005 Phone (702) 293-8923 Fax (702) 293-8025

ATTACHMENT D

INCIDENTAL BUSINESS PERMITS - FEE STRUCTURE
EFFECTIVE JANUARY 1, 1997

The fee structure outlined in the table below will be updated in 2003.

COST DESCRIPTION	SCHEDULE A		SCHEDULE B	
	1 year	2 year	1 year	2 year
Processing (new permittees only / one-time charge not included in overall fee)	\$20.00	N/A	\$20.00	N/A
Administrative	132.49	132.49	103.50	103.50
Monitoring	138.18	276.36	77.06	154.12
TOTALS	\$270.67	\$408.85	\$180.56	\$257.62
Total Permit Fee (does not include processing fee)	\$270	\$410	\$180	\$260

Explanation of fee structure chart and resulting fees:

The Incidental Business Permits (IBP) are divided into a "no fee" and two fee categories: Schedule A and Schedule B. The primary difference between the fee categories is the potential amount of monitoring involved. The "no fee" category will apply to public emergency services. The following criteria are used to determine into which category a commercial visitor service will be placed:

Schedule A — A commercial service will be charged the higher fee for one or more of the following reasons:

- An elevated level of monitoring may be required for the service
- A higher possibility of negative impact on natural resources
- Greater potential for hazardous material contamination is present
- Greater potential for Ranger response is a factor in the service (i.e., safety issues, EMS responses, etc.)

Examples of large services include:

- Jeep tours
- SCUBA instruction & charters
- Waterski instruction
- Canoe/raft delivery/retrieval
- Marine salvage
- Wilderness trips
- Boat repair (all)
- Tree trimmers

Schedule B — A commercial service will be charged the smaller fee if none of the above criteria are involved and there is no anticipated need for a high level of monitoring. In addition, some commercial services are placed in the small fee category due to a short season of operation (i.e., hunting guides).

Examples of small services include:

- Boat brokers/marine appraisers/marine surveyors
- Trailer village appraisers
- Upholstery/canvas repair & installation
- Boat detailing (wash & interior)
- Fishing guides
- Hunting guides
- Satellite dish installation
- Radio marine band installation
- Vehicle shuttle services
- Boat lifts/hoists

The processing fee is a one-time only charge that will be applied to all new permits, and it is the same for every applicant. New permittees will only be issued a one-year permit. Upon renewal, all IBP holders will be offered the option of renewing for either one or two years. The two-year permit ends up being less expensive, as the permittee is charged the same amount for administrative fees regardless of whether the IBP is for one or two years. Like the two fee categories, the primary difference between the two-year and the one-year permit is the monitoring cost.

BREAKDOWN AND JUSTIFICATION OF FEES

Processing Fee:

Phone call — response time averages 15 minutes	Labor(GS-9) * \$4.33 (15 minutes)	4.33
Response — letter & information - paper, printing, envelope, postage, copying (labor), brochure, attachment B, list of concessioners	Copy - \$0.10/pg. 10 pg. avg. \$1.00 Postage .57 Supplies .30 Labor(GS-5) 2.86 (15 minutes) Labor(GS-3) 2.528 (15 minutes)	7.01
Budget Personnel — processing application fee, labor (printing receipt, posting & depositing)	Labor(GS-7) \$ 7.08 (30 minutes) Receipt 3 @ \$0.10 ea. .30	7.38
SUBTOTAL		\$18.72
Overhead — phone, electricity, furniture, equipment	10% of total**	1.87
SUBTOTAL		20.59
Miscellaneous — salary increases and unforeseen expenses	5% of total (incl. overhead)	1.03
TOTAL		21.62
PROCESSING FEE		\$20.00

* For consistency, all salaries are computed at the step-1 level on an hourly basis with 20% added for benefits

** The standard most often used for overhead is 10% of total costs

Administrative Costs:

		A	B
Staff Meetings & Training — IBP program (includes travel)	\$1,000/yr divided between 60 permits	16.67	16.67
Staff Review — Concessions, Rangers, Maintenance, Management Team (new services)	Labor(GS-12) 25.10 2 hrs - schedule A 1 hr - schedule B	50.20	25.10
Preparation of IBP	Labor(GS-7) 14.15 (1 hour)	14.15	14.15
Preparation of ID Cards — supplies, labor	Supplies 1.00 Labor(GS-7) 14.15 (1 hour)	15.15	15.15
Supplies — actual permit, copies to all who need — Rangers, PWFA, Concessioners, Maintenance, etc.	Copy \$0.10/pg. Avg. 7 pgs. .70 (permit) Copies - 5 per IBP @ 7pgs. ea. 3.50	4.20	4.20
Billing — supplies, labor	Labor(GS-7) 7.08 (30 minutes) Receipts 3 @ \$0.10 ea. .30	7.38	7.38
Mailing of Documents & ID Cards — 2 mailings, supplies, postage, labor, envelopes	1st mailing .57 Labor(GS-3) 2.28 (15 minutes) 2nd mailing 1.14 (incl. ID cards) Padded envelope .69 Labor(GS-3) 2.28 (15 minutes)	6.96	6.96
SUBTOTAL		\$114.71	\$89.61
Overhead — phone, electricity, furniture, equipment	10% of total	11.47	8.96
SUBTOTAL		126.18	98.57
Miscellaneous — salary increases and unforeseen expenses	5% of total (incl. overhead)	6.31	4.93
TOTAL		\$132.49	\$103.50

Monitoring Costs:

		A	B
Rangers / Dispatch — vehicles & boats, excluding SAR, EMS, emergency response by NPS or other agencies (costs for these services recovered after incident occurs)	Schedule A - 103.92 (6hrs/yr (GS-9) 1hr/mo for 6 mos) Schedule B - 51.96 (3hrs/yr (GS-9) 1hr/mo for 3 mos)	103.92	51.96
Concessions — checking licenses, staff & vehicle time	4hrs/month for all 60 permits (GS-9) All permits 69.28 Divided by 60 <u>1.15</u> x 12 months =13.80	13.80	13.80
Vehicles & Boats — Rangers	Car/month 4.50 Boat/month 5.00 Total 9.50 divided by 60 <u>.16</u> x 12 months =1.92 x 6 months = .96	1.92	.96
SUBTOTAL		\$119.64	\$66.72
Overhead — phone, electricity, furniture, equipment	10% of total	11.96	6.67
SUBTOTAL		131.60	73.39
Miscellaneous — salary increases and unforeseen expenses	5% of total (incl. overhead)	6.58	3.67
TOTAL		\$138.18	\$77.06

APPENDIX B: ANALYSIS OF RECREATIONAL CARRYING CAPACITY

Boating carrying capacities were determined for Lakes Mead and Mohave based on current planning frameworks such as the limits of acceptable change and visitor impact management. These frameworks use the concepts of indicators and standards of quality to approach carrying capacity by comparing existing conditions for a given area against standards of quality (Graefe et al. 1990; Stankey et al. 1985).

Selecting appropriate indicators and standards of quality as limiting factors was a critical step in the process of estimating the carrying capacity of various lake zones for boating. The concept of limiting factors was used in this analysis and three indicators were selected: safety, shoreline accessibility, and social carrying capacity. Considering these three factors for different types of settings/experiences results in a wide range of boating capacity alternatives for Lake Mead National Recreation Area.

CARRYING CAPACITY BASED ON SAFETY

This limiting factor is based on safety and is derived from the traditional “space standards” approach for assessing boating carrying capacity (Bureau of Outdoor Recreation 1970). This approach specifies the amount of space needed for safe boat operation (expressed in acres of surface area per boat, or acres per boat). A wide range of boating space standards have been suggested in the literature, but there is no particular justification or validation for any of them. Precedents from several other studies were used to determine a reasonable range of space standards for Lake Mead National Recreation Area.

In the *Lake Management Plan* for Lake Powell, another large Colorado River reservoir managed by the National Park Service (NPS), 9 acres per boat was used as a guideline for safe boating on open water (NPS 1987). This standard was based on a 1977 survey by the Bureau of Outdoor Recreation that suggested a range of 9 to 18 acres per boat. To calculate a range of boating capacities for different types of boating settings and experiences at Lake Mead National Recreation Area, a value of 9 acres per boat was used as the middle value. This value and four additional values ranging from 100% above 9 acres per boat to 50% below (i.e., ranging from 4.5 to 18 acres per boat) were used as levels for the five recreation opportunity spectrum categories defined for Lake Mead National Recreation Area. The lowest value of 4.5 acres per boat was used for the urban park setting and is comparable to the boating capacity standard used at Lake Perris, a high-density urban lake in southern California.

For this limiting factor, boating capacity was determined by dividing the number of water surface acres in each zone by the “acres per boat” standard (table B-1). According to this factor, the boating capacity of Lake Mohave could range from about 1,500 boats if the entire lake was zoned as primitive to over 6,000 boats if the entire lake was zoned as urban park. The actual recommended boating capacity of the lake using this method would be somewhere between these values depending on the settings assigned to each zone in the management plan under the different alternatives. Likewise, the capacity of Lake Mead using this method would be between about 7,000 and 29,000 boats. Since this boating capacity calculation is based on the size of the lake, safety would be more of a limiting factor at Lake Mohave than at Lake Mead.

CARRYING CAPACITY BASED ON SHORELINE ACCESSIBILITY

This limiting factor is based on shoreline accessibility, which assumes that all boating parties require some means of accessing the shore. Those who are camping on the lake need space for their campsite, while day users need a place to pursue shore-based activities or seek refuge in bad weather. The boating capacity is limited by the amount of usable shoreline in each zone. Usable shoreline is different from total shoreline, because much of the lakeshore is rocky slopes or steep cliffs that cannot be accessed easily by a boat. The usable types of shoreline include sand and gravel beaches, and only 12% of the Lake Mohave shoreline and 7% of the Lake Mead shoreline are usable for recreation purposes.

TABLE B-1: BOATING CAPACITIES FOR EACH ZONE BASED ON STANDARDS FOR BOATING SAFETY

Standard	Type of Setting/Experience (Recreation Opportunity Spectrum)				
	Primitive	Semiprimitive	Rural Natural	Urban Natural	Urban Park
	18 acres per boat	13.5 acres per boat	9 acres per boat	6.75 acres per boat	4.5 acres per boat
Lake Mohave					
Zone	Boats at Any One Time				
1	143	191	287	382	573
2	227	303	455	607	910
3	684	912	1,368	1,824	2,736
4	214	285	428	570	855
5	128	170	255	340	510
6	39	52	79	105	157
7	25	33	50	66	99
8	47	63	95	126	189
9	15	20	29	39	59
Total	1,522	2,030	3,044	4,059	6,089
Lake Mead					
Zone	Boats at Any One Time				
10	539	719	1,078	1,437	2,156
11	743	990	1,486	1,981	2,971
12	520	693	1,040	1,386	2,079
13	104	138	207	276	414
14	788	1,051	1,577	2,102	3,154
15	606	808	1,213	1,617	2,425
16	624	832	1,249	1,665	2,497
17	738	984	1,477	1,969	2,953
18	607	810	1,215	1,620	2,429
19	356	475	712	950	1,425
20	504	672	1,008	1,344	2,016
21	91	121	181	242	362
22	536	714	1,071	1,429	2,143
23	219	292	438	638	876
24	232	310	464	619	929
Total	7,208	9,610	14,415	19,275	28,831
Total for Lake Mead National Recreation Area	8,730	11,640	17,459	23,334	34,920

For this limiting factor, the boating capacity was calculated by dividing the number of feet of usable shoreline in each zone by a range of values representing the number of feet required per boat. Again, the value used for Lake Powell, 100 feet per boat, was used as the middle value. This value and four additional values ranging from 100% above 100 feet per boat to 50% below (i.e., ranging from 200 to 50 feet per boat) were used as levels for the five recreation opportunity spectrum categories defined for the Lake Mead National Recreation Area. This factor limits the concentration of boats on the shoreline (and thus the boating capacity) and varies for different kinds of settings on the lake (table B-2). For example, campsites would be smaller and closer together in urban zones and larger and farther apart in more primitive zones.

Because of the limited amount of usable shoreline on both lakes, boating capacities based on shoreline accessibility tend to be smaller than those based on the safety factor. The two lakes show more similar boating capacities using this method because the amount of usable shoreline areas for each lake is more comparable than the overall surface areas. Based on shoreline accessibility, the overall boating capacity of Lake Mohave would be between about 1,000 and 3,800 boats, while the boating capacity of Lake Mead would be between about 1,300 and 5,300 boats. These numbers are probably very conservative because the analysis assumes all boaters would use the shoreline simultaneously, which would only happen under unusual circumstances, such as a sudden storm.

CARRYING CAPACITY BASED ON SOCIAL FACTORS

This limiting factor is based on the social carrying capacity and incorporates visitor survey data related to zone-specific crowding perceptions and boating density levels. In this case it was not possible to simply calculate a range of boating capacities based on the physical dimensions of the zones and a range of space standards. Because this indicator is based on visitor perception, it was necessary to evaluate the impacts of different boating densities on the quality of the visitor experience in the various zones on the lakes. The 1993–94 survey of lake users included several measures of crowding and visitor perceptions on the quality of the recreation experience. These measures were used to select a range of standards that could be used to calculate boating capacities.

Previous studies suggest that the level of crowding affects the quality of the visitor experience. Crowding was measured with a 9-point scale that has been used in many previous recreation visitor studies. The effect of crowding on visitor experience was measured through a questionnaire that asked boaters how the number of visitors encountered (the crowding level) affected their experience (increased their enjoyment, no effect, reduced their enjoyment). The data for boaters who reported their encounters with other visitors “reduced their enjoyment” was compared across different levels of crowding. Figure B-1 shows the percentage of boaters that reported reduced enjoyment at different levels of crowding during different parts of their trip (i.e., start of trip, out on the lake, etc.).

The results in figure B-1 show that as the perceived level of crowding increases, the number of boaters who reported reduced enjoyment also increases. For a low level of crowding, about 20% of the boaters reported reduced enjoyment, while for extremely crowded conditions, almost 60% of the boaters reported reduced enjoyment. Which part of the trip the boater was on (start of trip, on the lake, along the shoreline, or end of trip) didn’t change the percentage of boaters reporting reduced enjoyment for a given level of crowding (percentages varied by only a few percent). There is only a slight increase in reduced enjoyment when comparing moderately crowded conditions with extremely crowded conditions (about 5%). These results agree with findings of other studies and suggest that crowding starts to become a problem to recreation visitors when it reaches moderate levels (i.e., 5 or higher on the 9-point scale). In this case, the majority of visitors who reported crowding scores above 4 on the 9-point scale experienced a loss of enjoyment with their recreation experience. This finding was used as a basis for selecting a middle level crowding standard of 4 for this carrying capacity analysis.

TABLE B-2: BOATING CAPACITIES FOR EACH ZONE BASED ON STANDARDS FOR SHORELINE ACCESSIBILITY

Standard	Type of Setting/Experience (Recreation Opportunity Spectrum)				
	Primitive	Semiprimitive	Rural Natural	Urban Natural	Urban Park
	200 feet per boat	150 feet per boat	100 feet per boat	75 feet per boat	50 feet per boat
Lake Mohave					
Zone	Boats at Any One Time				
1	175	263	350	525	701
2	115	173	231	346	461
3	235	352	469	704	939
4	242	362	483	725	967
5	79	119	159	238	318
6	29	44	58	88	117
7	8	13	17	25	34
8	58	87	116	174	231
9	18	27	36	54	72
Total	960	1,439	1,919	2,879	3,839
Lake Mead					
Zone	Boats at Any One Time				
10	105	157	210	315	420
11	256	384	512	769	1,025
12	145	217	289	434	578
13	8	12	16	25	33
14	127	190	253	380	506
15	10	15	20	30	39
16	43	65	86	130	173
17	185	278	370	556	741
18	151	226	301	452	603
19	35	52	69	104	138
20	125	188	251	376	501
21	14	21	27	41	55
22	88	132	176	264	352
23	9	13	18	26	35
24	13	20	27	40	54
Total	1,313	1,970	2,627	3,940	5,253
Total for Lake Mead National Recreation Area	2,273	3,409	4,546	6,819	9,092

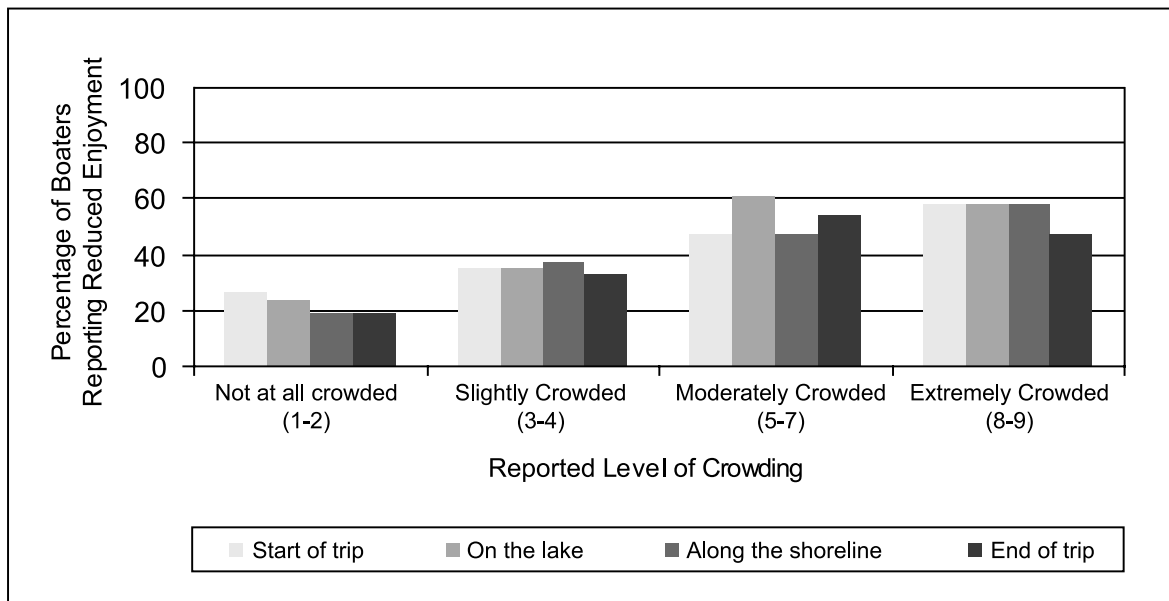


FIGURE B-1: RELATIONSHIP BETWEEN CROWDING AND ENJOYMENT

As in the case of the other limiting factors, it was necessary to develop a range of crowding standards for different types of settings. Higher crowding levels are expected and accepted in more urbanlike zones than in more primitivelike zones. Crowding levels ranging from 2 through 5 were used to define the social experience for the various types of settings offered at Lake Mead National Recreation Area. The urban park zone was assigned the highest crowding standard level of 5, the urban natural zone was assigned a level of 4, the rural natural setting was assigned a level of 3, and the lowest level of 2 was used for both the primitive and semiprimitive zones.

These standards are generally consistent with the crowding levels reported by boaters at several access points in the 1993–94 user survey (figure B-2). The average crowding levels perceived by boaters on both lakes were generally lower than 3 on the 9-point scale. On Lake Mohave, boaters using Katherine Landing tended to report the highest crowding levels. These average crowding scores were 4 or higher for all parts of the boating trip.

To establish boating capacities in each zone based on the crowding standards, it was necessary to determine the relationship between boating densities and crowding scores. This required linking average crowding scores to particular locations (zones) and boating densities on the lakes. Boaters reported which zone they spent the most time in, and this information was used to establish boating densities for each zone. These boating densities were correlated with the data on perceived crowding levels for each zone. Figure B-3 illustrates how perceived crowding relates to the number of boats in zone 1 on Lake Mohave. Perceived crowding level increases with increasing boat densities, from below 3 at the lowest densities to over 6 at peak use levels. Plotting a straight line through these data points provides a mathematical relationship that can be used to determine an estimate of the boating density for various levels of perceived crowding. For example, in zone 1 on Lake Mohave, a perceived crowding level of 4 indicates a boating density of about 400, and a perceived crowding level of 5 indicates a boating density of about 560.

Data corresponding to perceived crowding levels at each zone on Lakes Mead and Mohave were collected and used to calculate boating capacities for each zone (table B-3). Some of the cells in table B-3 are blank because some zones did not have complete data corresponding to the perceived crowding levels. For example, lightly used areas, such as zones 16, 19, or 24, typically showed very low crowding levels so it was not possible or appropriate to project the numbers of boats that would be required to achieve crowding levels of 4 or 5 in these zones. Likewise, it is not reasonable to expect a primitive experience in some areas, such as zones 10 through 12

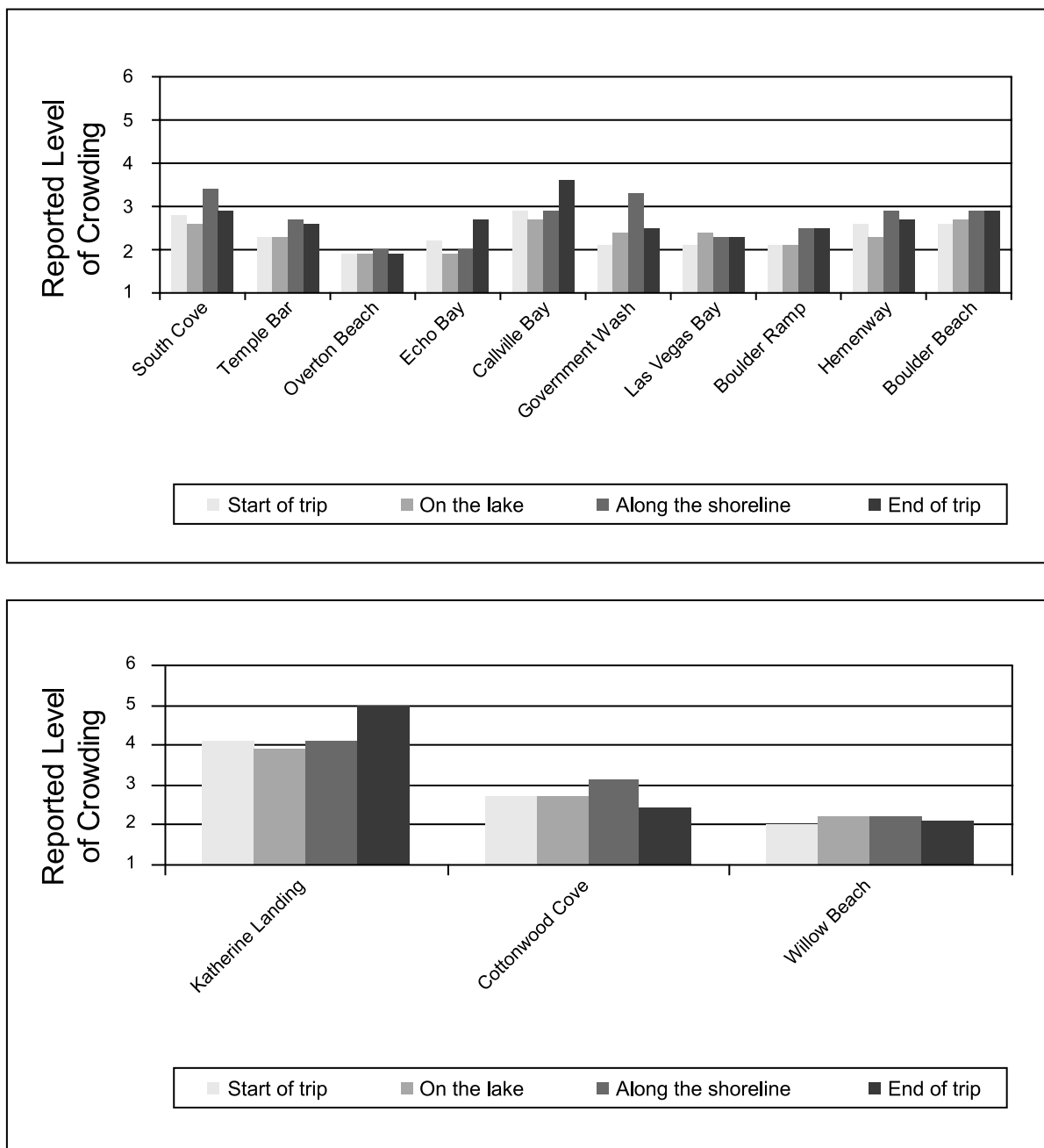


FIGURE B-2: CROWDING RATING BY ACCESS POINT

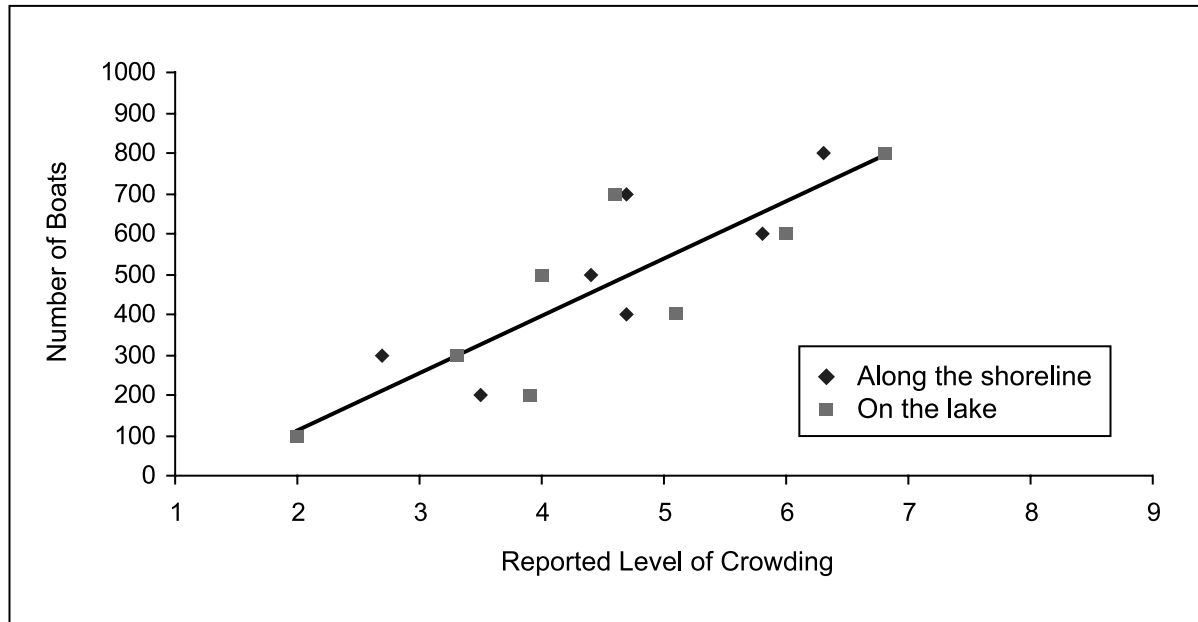


FIGURE B-3: CROWDING BY NUMBER OF BOATS IN ZONE 1

on Lake Mead or zones 1 through 3 on Lake Mohave, so there is no need to project the boating densities from a high average crowding level to estimate boating densities at crowding levels of 1 and 2. Because some cells have no data in table B-3, it is not possible to calculate total lake capacities for each type of setting as was done in tables B-1 and B-2. However, such lake totals are not important because it is not likely that either lake would be zoned entirely for a single type of setting or experience. The data in table B-3 covers the reasonable alternatives for each zone and can be compared with corresponding data in tables 1 and 2 to determine a recommended boating capacity based on the most limiting factor (safety, shoreline accessibility, or crowding) for each zone.

Table B-4 summarizes the boating capacities in each zone for several planning alternatives at Lake Mead National Recreation Area. The values in the table show the most limiting factor (or smallest boating capacity) from the safety, shoreline accessibility, and social carrying capacity analyses for the designated settings under each alternative. The alternatives represent different zoning schemes under four alternatives for managing the Lake Mead National Recreation Area. Alternative C, the preferred alternative, allows for expanding the boating capacity from the current capacity of 4,437 boats to 5,055 boats at any one time, while maintaining a more diverse range of recreational opportunities within the recreation area.

TABLE B-3: BOATING CAPACITIES FOR EACH ZONE BASED ON STANDARDS FOR CROWDING

Standard	Type of Setting/Experience (Recreation Opportunity Spectrum)				
	Primitive	Semiprimitive	Rural Natural	Urban Natural	Urban Park
	Crowding Average=2	Crowding Average=2	Crowding Average=3	Crowding Average=4	Crowding Average=5
Lake Mohave					
Zone	Boats at Any One Time				
1	—	—	250	400	560
2	—	—	150	260	350
3	—	—	200	325	500
4	40	40	125	250	400
5	25	25	100	—	—
6	25	25	48	70	—
7	20	20	50	—	—
8	75	75	100	125	—
9	15	15	70	125	—
Lake Mead					
Zone	Boats at Any One Time				
10	—	—	165	260	330
11	—	—	285	470	650
12	—	—	250	410	650
13	25	25	60	90	125
14	40	40	75	150	
15	—	—	11	13	15
16	85	85	—	—	—
17	160	160	260	360	460
18	160	160	320	480	670
19	20	20	60	—	—
20	60	60	280	420	—
21	—	—	8	27	50
22	—	—	100	180	280
23	20	20	40	70	90
24	8	8	25	—	—

TABLE B-4: SUMMARY OF BOATING CAPACITIES FOR EACH ALTERNATIVE

	Alternative A (No Action)		Alternative B		Alternative C (Preferred Alternative)		Alternative D	
Zone	Recreational Setting	BAOT	Recreational Setting	BAOT	Recreational Setting	BAOT	Recreational Setting	BAOT
Lake Mohave								
1	U	560	U	560	U	560	U	560
2	U	350	UN	260	UN	350	UN	260
3	UN	325	RN	200	UN	325	U	500
4	UN	250	RN	125	UN	250	U	400
5	RN	100	RN	100	RN	100	RN	100
6	RN	48	SP	25	RN	48	UN	70
7	RN	17	SP	13	RN	17	RN	17
8	RN	95	RN	95	RN, SP, P	95	UN	125
9	RN	29	P	15	SP, RN, P	15	RN	29
Total		1,774		1,393		1,760		2,061
Lake Mead								
10	U	330	U	330	U	330	U	330
11	U	650	U	650	U	650	U	650
12	U	578	U	578	U	578	U	578
13	U	33	UN	25	UN	25	UN	25
14	UN	380	RN	75	RN	75	RN	75
15	UN	13	SP	11	RN, SP, P	11	RN	11
16	UN	130	RN	86	RN	86	UN	130
17	U	460	UN	360	U	460	U	460
18	U	603	RN	301	UN, RN, SP, P	452	U	603
19	UN	104	RN	60	RN	60	UN	104
20	U	501	UN	376	UN	376	U	501
21	U	50	RN	27	RN	27	UN	27
22	U	280	RN	100	RN	100	UN	180
23	UN	35	P	13	RN, SP	40	RN	40
24	UN	54	P	8	RN	25	RN	25
Total		4,201		3,000		3,295		3,739
Total Lake Mead National Recreation Area		5,975		4,393		5,055		5,800
BAOT = Boats at any one time U = Urban UN = Urban natural RN = Rural natural SP = Semiprimitive P = Primitive BAOT = Boats at any one time								

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APPENDIX C: SUMMARY OF OPERATIONS UNDER FORECASTED WATER ELEVATIONS

In December 2000 the Secretary of the Interior, acting through the U.S. Bureau of Reclamation, adopted specific interim criteria under which surplus water conditions may be declared in the lower Colorado River Basin during a 15-year period that would extend through 2016. An environmental impact statement was prepared to address the environmental issues and analyze the environmental consequences of various alternatives for specific interim surplus criteria. This summary addresses the impacts of adopting the surplus criteria on the recreational opportunities and park operations on Lake Mead only, since operations on Lake Mohave would not be affected. This information was gathered from the *Final Environmental Impact Statement for the Colorado River Interim Surplus Criteria, 2000*.

IMPACTS ON PARK OPERATIONS

Six marinas at Lake Mead provide boat launching facilities, slips and storage, and fuel. The marinas include Lake Mead Marina (Boulder Beach), Las Vegas Bay, Callville Bay, Echo Bay, Overton Beach, and Temple Bar. There are also three boat ramps without associated marinas. These include Hemenway, Government Wash, and South Cove. Pearce Ferry has no boat ramp but is used as a take-out for private and commercial boaters using kayaks and rafts.

Facilities at Lake Mead were designed to operate most effectively between the elevations of 1,180 and 1,210 feet above mean sea level. Below a lake elevation of 1,180 feet above mean sea level, facilities must be reconfigured to keep them operational. This includes extending utility systems (water, power, sewer); moving anchoring systems at marinas, water intakes, and launch ramps; grading parking lots; moving sanitation facilities at beaches; and much more. Costs to make the adjustments to the major facilities at year 2000 price levels range from \$560,000 to \$970,000 (table C-1). There are additional costs required for any 20-foot drop below the 1,180-foot level, ranging from \$480,000 to \$800,000 per 20-foot drop.

In addition, the threshold elevation for accessing the Pearce Ferry takeout (by rafts and other motorized vessels) is 1,183 feet above mean sea level. Once Pearce Ferry is inaccessible as a takeout, boaters must continue downstream to South Cove, an additional 16 miles. This costs river runners fuel and time and may increase safety problems. For commercial boaters, there would be additional time involved, which could result in a loss of business and the inability to keep schedules.

The Bureau of Reclamation predicts that the median elevation of Lake Mead at the end of year 15 will be 1,143 above mean sea level. These predictions could fluctuate based on the level of precipitation and other factors.

IMPACTS ON RECREATIONAL OPPORTUNITIES

The safety of boaters was also considered in the Bureau of Reclamation evaluation. When lake elevations drop below 1,170 feet above mean sea level, the upper arms of the lake and inflow areas would pose a risk to boaters due to exposed sediment and the lack of a defined river channel. Lower lake levels would create hazards to boaters by exposing more reefs and rocks.

In addition to the navigational hazards posed by lower lake levels, the safe boating capacity decreases as the lake elevation decreases. While the Bureau of Reclamation used nine-surface-acres per boat as the safe boating capacity at full pool, the National Park Service developed a boating capacity based on limiting factors such as safety, shoreline accessibility, and social carrying capacity. Considering these factors, the capacity of boats at any one time on Lake Mead, evaluated in this environmental impact statement, ranged from 3,000 boats to 3,717 boats. This number could decrease based on the predictions for lower lake levels.

**TABLE C-1: COSTS INCURRED TO RECREATIONAL FACILITIES
FROM LAKE MEAD POOL FLUCTUATIONS BASED ON YEAR 2000 PRICE LEVELS**

Fluctuation	Cost per Increment
Cost to LAME (spell out) facilities if surface elevation drops below 1,180 feet above mean sea level ¹	\$6,011,000
Cost to LAME facilities at 1,160 feet above mean sea level and for each additional 20-foot drop ¹	\$5,808,000
Cost to Lake Mead Resort Marina from a 20-foot drop in elevation ²	\$91,400
Cost to Overton Beach Marina facilities from a drop from 1,212 feet above mean sea level to 1,150 feet above mean sea level (62 feet) ³	\$60,000
Cost to Overton Beach Marina facilities from a drop from 1,150 feet above mean sea level to 1,130 feet above mean sea level (20 feet) ³	\$425,000
Cost to Temple Bar Resort from a 10-foot drop ⁴	\$12,500
Cost to Echo Bay Resort from a 20-foot drop from 1,213 feet above mean sea level to 1,193 feet above mean sea level ⁵	\$38,400
<p>1. Unpublished data from Lake Mead National Recreation Area.</p> <p>2. Letter dated April 11, 2000, from Lake Mead Resort to the Bureau of Reclamation. The letter quantifies a drop from current pool elevations. It also notes that a drop below 1,150 feet above mean sea level would, under judgement of the National Park Service, require abandonment of the basin within which the resort is located.</p> <p>3. Letter dated March 29, 2000, from Overton Beach Marina to the Bureau of Reclamation.</p> <p>4. Letter dated March 27, 2000, from Temple Bar Resort. Midpoint of range (\$10,000 to \$15,000) is used. Letter further notes that a drop below 1,125 feet above mean sea level would require a complete relocation of the marina, including buildings located on land.</p> <p>5. Letter dated March 16, 2000, from Echo Bay Resort to the Bureau of Reclamation.</p>	

APPENDIX D: CHRONOLOGY OF LAKE MANAGEMENT PLAN PUBLIC MEETINGS AND PRESENTATIONS

September 5, 2002	Draft PWC rule published in Federal Register
August 19, 2002	Laughlin Chamber of Commerce
July 24, 2002	WON Bass
July 15, 2002	U.S. Fish and Wildlife Service
June 28, 2002	Laughlin Chamber of Commerce
June 26, 2002	Public comment period closed on LMP/DEIS
June 22, 2002	Nevada Wildlife Commission
June 21, 2002	Arizona Department of Game and Fish
June 19, 2002	Nevada Division of Wildlife
June 19, 2002	Searchlight Town Board
June 16, 2002	Lake Mead Boat Owners Association
June 11, 2002	Laughlin Town Board
May 23, 2002	LMP/DEIS Public Information Meeting – Kingman, Arizona
May 22, 2002	LMP/DEIS Public Information Meeting – Boulder City, Nevada
May 21, 2002	LMP/DEIS Public Information Meeting - Las Vegas, Nevada
May 15, 2002	LMP/DEIS Public Information Meeting – Bullhead City, Nevada
May 14, 2002	LMP/DEIS Public Information Meeting – Overton, Nevada
May 13, 2002	LMP/DEIS Public Information Meeting – Meadview, Arizona
April 24, 2002	Lake Management Plan/Draft Environmental Impact Statement Released
December 12, 2001	Arizona Department of Game and Fish
August 16, 2001	Boulder City Rotary Club
June 27, 2001	American Watercraft Association
June 1, 2001	Meadview Community Meeting
May 30, 2001	Friends of Nevada Wilderness
May 3, 2001	Southern Nevada Federal Land Managers
March 13, 2001	Desert Water Safety Council
February 28, 2001	Coordination Meeting with Arizona Department of Game and Fish
February 1, 2001	Coordination Meeting with Nevada Division of Wildlife
January 24, 2001	Paddlecraft Operators IBP Meeting
January 8, 2001	Meadview Community Meeting
September 17, 2000	Lake Mead Boat Owners Association
September 7, 2000	Grand Canyon National Park / Hualapai Nation Coordination Meeting
August 16, 2000	Nevada SCUBA Retailers Association
August 15, 2000	Las Vegas Fly Fisherman's Club
April 19, 2000	National Water Safety Congress
April 14, 2000	National Park Service / Nevada Division of Wildlife Coordination Meeting
March 8, 2000	Hot Summer Nights Ski Club
March 1, 2000	Power Squadron
February 2, 2000	National Park Service / Arizona Game and Fish Coordination Meeting
December 1, 1999	National Carrying Capacity Conference — Aspen, Colorado

November 6, 1999	Lake Mead Boat Owners Association
October 5, 1999	States Organization of Boating Administrators — Little Rock, Arkansas
August 20, 1999	Grand Canyon National Park / Hualapai Nation Coordination Meeting
June 29, 1999	National Park Service / Nevada Division of Wildlife Coordination Meeting
June 27, 1999	Lake Mead Boat Owners Association
May 14, 1999	Clark County Boating Access Committee
March 16, 1999	Rotary — Henderson
March 15, 1999	Noon Rotary — Boulder City
March 13, 1999	Native American Tribal Consultation Meeting
March 9, 1999	Nevada SCUBA Retailers Association
February 18, 1999	Annual National Park Service / Concessioners Meeting
January 19, 1999	Las Vegas Kiwanas Club
November 12, 1998	Power Squadron
November 11, 1998	Grand Canyon River Runners Association — Annual Meeting
October 14, 1998	Desert Valley Water Safety Council
September 16, 1998	Clark County Wildlife Advisory Board
September 10, 1998	Noon Rotary — Boulder City
September 9, 1998	Lake Mead Sailing Club
September 8, 1998	National Recreation Lakes Commission
August 26, 1998	Native American Tribal Consultation Meeting
July 30, 1998	Public Information Meeting — Henderson, Nevada
July 23, 1998	Public Information Meeting — Vegas, Nevada
July 22, 1998	Public Information Meeting — Overton, Nevada
July 21, 1998	Public Information Meeting — Kingman, Arizona
July 20, 1998	Public Information Meeting — Alan Bible Visitor Center
July 16, 1998	Clark County Boating Access Committee
May 16, 1998	Colorado River — Public Scoping Meeting
April 16, 1998	Coordination Meeting with the Hualapai Nation
March 31, 1998	Commercial Divers Association
February 18, 1998	Annual National Park Service / Concessioners Meeting
January 30, 1998	National Park Service / Arizona Game and Fish / Nevada Division of Wildlife Coordination Meeting
January 20, 1998	U.S. Coast Guard Auxiliary
January 9, 1998	Community Meeting — Meadview, Arizona
December 11, 1997	Grand Canyon Outfitters Association
December 8, 1997	National Park Service / Hualapai Nation Coordination Meeting
November 20, 1997	Sunrise Rotary — Boulder City
October 21, 1997	U.S. Coast Guard Auxiliary
October 8, 1997	Colorado River Boating Law Administrators Meeting
September 10, 1997	Southern Nevada Paddle Club
September 10, 1997	Noon Rotary — Boulder City
September 5, 1997	Community Meeting — Meadview, Arizona
September 3, 1997	Lake Mead Yacht Club
June 7, 1997	Sierra Club Resource Meeting
May 20, 1997	Seven Crowns Resort

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May 13, 1997	Colorado River Law Enforcement Meeting
May 7, 1997	National Park Service / Nevada Division of Wildlife Coordination Meeting
March 9, 1997	Canoe Focus Group Public Meeting — Alan Bible Visitor Center
February 26, 1997	Annual Concessioners Meeting
February 11, 1997	Overton Beach Resort
February 3, 1997	National Park Service / Arizona Game and Fish Coordination Meeting
December 19, 1996	Scoping Issues Newsletter
December 10, 1996	Fisheries Community Focus Meeting — Alan Bible Visitor Center
November 26, 1996	Bureau of Land Management — Lake Havasu Coordination Meeting
October 25, 1996	Grand Canyon River Runners Association — Annual Meeting
September 4, 1996	Coordination Meeting with the Personal Watercraft Industry
August 18, 1996	Lake Mead Boat Owners Association
August 7, 1996	Las Vegas Kayak Club
July 17, 1996	Fisheries Community Focus Meeting — Alan Bible Visitor Center
April 11, 1996	Grand Canyon River Concessioners Meeting
March 6, 1996	Tribal Consultation Meeting — Avi Hotel, Laughlin, Nevada
February 8, 1996	National Park Service / Arizona Game and Fish Coordination Meeting
February 2, 1996	Community Meeting — Meadview, Arizona
January 31, 1996	National Park Service / Concessioners Annual Meeting
December 15, 1995	Informational Meeting with the Mohave County Board of Supervisors
October 13, 1995	National Park Service Coordination Meeting with Glen Canyon National Recreation Area
August 8, 1995	Mohave County Land Use Committee
June 18, 1995	Lake Mead Boat Owners Association
June 14, 1995	Colorado River Utility Users Meeting
April 12, 1995	Arizona Game and Fish Department
March 1, 1995	National Park Service / Nevada Division of Wildlife Coordination Meeting
February 8, 1995	Lake Mead Sailing Club
January 19, 1995	National Park Service Annual Concessioners Meeting
December 8, 1994	Public Scoping Meeting — Las Vegas, Nevada
November 15, 1994	Public Scoping Meeting — Overton, Nevada
November 11, 1994	Public Scoping Meeting — Riverside, California
November 11, 1994	Public Scoping Meeting — St. George, Utah
November 4, 1994	Public Scoping Meeting — Meadview, Arizona
November 2, 1994	Public Scoping Meeting — Bullhead City, Arizona
November 1, 1994	Public Scoping Meeting — Kingman, Arizona
October 27, 1994	Public Scoping Meeting — Boulder City, Nevada
October 26, 1994	Public Scoping Meeting — Henderson, Nevada
October 25, 1994	Public Scoping Meeting — Las Vegas, Nevada
April 20, 1994	Dolan Springs Community Meeting
April 13, 1994	National Park Service / Nevada Division of Wildlife Coordination Meeting
March 10, 1994	Nevada Striper Club
February 4, 1994	Public Informational Meeting — Alan Bible Visitor Center
January 20, 1994	Las Vegas Breakfast Club

October 23, 1993	Boulder City Community Club
October 7, 1993	Clark County Boating Safety and Facilities Committee
October 1, 1993	Colorado River Fisheries Committee
September 23, 1993	U.S. Coast Guard Auxiliary
August 12, 1993	Personal Watercraft Association of Southern Nevada
May 11, 1993	Briefing for Federal Land Managers
April 19, 1993	Presentation to the Arizona Game and Fish Department
March 31, 1993	National Park Service / Nevada Division of Wildlife Coordination Meeting
January 28, 1993	Sunrise Rotary — Boulder City

APPENDIX E: COMPARISON OF BOATING REGULATIONS

	National Park Service	State of Nevada	State of Arizona
Horn, whistle, bell	Vessels less than 12 meters in length must have some means of making an efficient sound. Vessels 12 to 20 meters in length must have a horn or whistle and bell.	Motorboats must have efficient whistle or mechanical device that produces sound. Bell required for motorboats 26 feet and longer.	No requirement.
Operator age requirement	National Park Service minimum age requirement for states will defer. National Park Service can enforce.	Personal watercraft: 12 years old ¹ or older. Towing waterskier: 14 years old or older (or 12 years old with 21-year old or older aboard).	12 years old or older if motor is 8 horsepower or larger (unless parent, guardian, or 18-year old or older is aboard).
Personal flotation device requirements	Waterskier: nonapproved device is permitted.	Waterskier: must wear approved device. All passengers aboard personal watercraft. Less than 12 years old when motorboat is in operation.	Waterskier: nonapproved device is permitted. All passengers aboard personal watercraft. 12 years old and under when motorboat is in operation.
Flat wake speed	In designated areas.	In marked areas.	Must obey posted limit.
Speed in proximity	(5 miles per hour or creating wake). 100 feet from down waterskier, swimmer, or diver's flag.	(5 nautical miles per hour). 100 feet from waterskier, bather. 200 feet from beach frequented by bathers, swimming float, dock or pier, dive flag.	May not operate at a speed greater than reasonable and prudent under existing conditions.
Waterskiing time of day	Prohibited sunset to sunrise.	Prohibited sunset to sunrise.	Prohibited sunset to sunrise.
Waterskiing observer	Observer required; must be observing.	Observer required; must be continuously observing.	Observer required; must be continuously observing.

	National Park Service	State of Nevada	State of Arizona
Waterskiing	Skier must wear personal flotation device (nonapproved device is permitted).	Skier must wear approved personal flotation device.	Skier must wear personal flotation device (nonapproved device is permitted).
Boating operation while towing a waterskier	Prohibited within 500 feet of harbors, swim beaches, or mooring areas, or within 100 feet of a person fishing, swimming, or a diver marker.	Prohibited to pass over towline of another vessel or skier (from reckless statute). Wakeless within 100 feet of down waterskier.	Can not tow persons so close to other watercraft, swimmers, or structures as to constitute a hazard to life or limb.
Waterskiing vessel capacity	Not defined.	Must be three or more people.	—
Waterskiing operator age	Not defined.	14 years old or older but may be 12 if supervised by a 21-year old or older.	—
Waterskiing observer age	Not defined.	12 years old or older but may be 10 years old if a 21-year old or older is aboard.	—
Waterskiing ski flag	Required (may be orange or red and measure at least 12 inches by 12 inches or rectangular).	Required (must be international orange and measure 12 inches by 12 inches).	Required bright or brilliant red or orange and measure 12 inches by 12 inches.
Personal watercraft — length	Not defined.	Class A motorboat less than 13 feet.	Watercraft propelled by machinery and less than 16 feet.
Personal watercraft — propulsion	Not defined.	—	Powered by a water jet pump.
Personal watercraft — mode of operator	Not defined.	Sitting, standing, or kneeling on rather than in.	Sits, stands, or kneels on rather than sitting or standing inside the watercraft.
Personal watercraft — maneuverability	Not defined.	Capable of sharp turns or maneuvers.	—
Personal watercraft — engine size	Not defined.	Has motor over 10 horsepower.	—

	National Park Service	State of Nevada	State of Arizona
Personal watercraft — operator age	Not defined.	12 years old or older. 14 years old or older for those born after January 1983, effective January 1, 2003.	12 years old or older (if engine is over 8 horsepower) unless parent, guardian, or 18-year old or older is aboard. Same as general age requirement.
Personal watercraft — personal flotation device	Not defined.	Operator must wear.	All passengers must wear.
Personal watercraft — reckless operation	—	If above flat-wake speed and within five boat lengths, reckless operation includes: jumping the wake, obstructing visibility, maneuvering quickly, turning sharply, or swerving.	If above flat-wake speed and within 60 feet of another boat, reckless operation includes: jumping the wake, obstructing visibility, maneuvering quickly, turning sharply, or swerving.
Personal watercraft — lanyard	—	—	Must use if vessel is manufactured without cut-off switch.
Personal watercraft — throttle return	—	—	Must be operational if applicable. If equipped by manufacturer, shall not operate vessel without a functioning spring-loaded throttle.
Alcohol consumption	No restriction.	No restriction.	No restriction.
Passengers under the influence	Prohibited if they pose a danger to themselves, others, property, or park resources.	No restriction.	No restriction.
Operator under the influence	May not operate when under the influence of alcohol or controlled substance.	May not operate while intoxicated or under the influence of a controlled substance (or combination).	May not operate if impaired to the slightest degree by alcohol, drugs, or vapor-releasing substance.
Operator under the influence — standard	To the extent that endangers (or may endanger) persons, property, or park resources.	Blood alcohol level of 0.10 or greater within 2 hours of operating.	Blood alcohol level of 0.08 or greater within 2 hours of operating.

	National Park Service	State of Nevada	State of Arizona
Operator under the influence — applicability	All “vessels” being operated.	“Vessels under power or sail” and while “operated” or “in actual physical control.”	“Motorized watercraft” “underway” and “operated” or “in actual physical control.”
Operator under the influence — waterskier	—	May not “manipulate” water skis, surfboard, or similar device while intoxicated or under the influence of a controlled substance.	No regulation.
Mandatory education	None.	Renters of personal watercraft. All boaters born after 1983.	None.
Swim from boats	May not swim from boat unless an operator is aboard and engine is off.	No regulation.	No regulation.
Operation in swim area	May not operate within 500 feet of a location designated as a swim area.	May not operate within a water area marked as a bathing or swimming area.	May not operate contrary to controlled use markers.
Dive flag	Divers must display a standard dive flag.	Dive flag must be displayed when diving or swimming below the surface with aid of a breathing device. Person must be diving or swimming below the surface at the time. Must be attached to a float, buoy, or boat and must have a light at night. Person must be within 100 feet of flag.	Dive flag required to be displayed when divers are actually below the water surface.
Other boats — dive flag	Flat-wake within 100 feet.	May not approach closer than 100 feet and must be flat-wake within 200 feet.	No specific regulation.

	National Park Service	State of Nevada	State of Arizona
Reckless operation	<p>May not operate in a reckless or negligent manner, or in a manner so as to endanger or be likely to endanger a person or property.</p> <p>National Park Service prohibits (in a separate regulation) riding on the gunwales, transom, or on the decking over the bow (motorboats only).</p>	<p>Shall not operate in a reckless or negligent manner so as to endanger the life or property of any person (includes manipulating waterskis, surfboard, or similar devices).</p> <p>Includes riding on the bow, gunwale, transom, or swim platform (motorboats only).</p> <p>Includes maneuvering a skier or device to pass over the towline of another vessel.</p> <p>Includes navigating any vessel, skier, or device between a towing vessel and its tow.</p>	<p>Shall not operate in a careless, reckless, or negligent manner (includes waterskis, surfboard, or similar device).</p> <p>Bow, transom, and gunwhale riding prohibited when above wakeless speed.</p> <p>Operating with passengers on the bow so as to obstruct the view of the operator is prohibited.</p> <p>Operator must be 12 years old or older if motor is greater than 8 horsepower unless parent, guardian, or person 18 years old or older is aboard.</p>
Overloading	—	May not be loaded with passengers or cargo beyond the maximum weight capacity, nor beyond its safe carrying capacity.	May not operate with passengers or cargo beyond its safe carrying capacity.
Navigation rules	Inland rules in their entirety.	Inland rules in their entirety.	<p>Powered vessels must yield to nonpowered vessels.</p> <p>Danger zone (crossing).</p> <p>Overtaking.</p> <p>Counterclockwise traffic pattern.</p> <p>Operator must use due caution to avoid an accident or collision (requires no whistle or signals).</p>

APPENDIX F: LISTING OF THREATENED AND ENDANGERED SPECIES AND SPECIES OF CONCERN AND USFWS BIOLOGICAL OPINION

ENDANGERED, THREATENED, AND CANDIDATE SPECIES OF NEVADA

(Updated April 4, 2000)

Species	Federal Status	Critical Habitat in Nevada	Recovery Plan
Birds			
Mountain plover, <i>Charadrius montanus</i> ^a	PT	N	N
Southwestern willow flycatcher, <i>Empidonax traillii extimus</i>	E	N	N
Bald eagle, <i>Haliaeetus leucocephalus</i> ^b	T	N	Y
Yuma clapper rail, <i>Rallus longirostris yumanensis</i>	E	N	Y
Reptile			
Desert tortoise, <i>Gopherus agassizii</i>	T	Y	Y
Amphibian			
Columbia spotted frog, <i>Rana luteiventris</i> (Great Basin pop.)	C	N/A	N/A
Fishes			
Warner sucker, <i>Catostomus warnerensis</i>	T	N	Y
Cui-ui, <i>Chasmistes cujus</i>	E	N	Y
White River springfish, <i>Crenichthys baileyi baileyi</i>	E	Y	Y
Hiko White River springfish, <i>Crenichthys baileyi grandis</i>	E	Y	Y
Railroad Valley springfish, <i>Crenichthys nevadae</i>	T	Y	Y
Devils Hole pupfish, <i>Cyprinodon diabolis</i>	E	N	Y
Ash Meadows Amargosa pupfish, <i>C. nevadensis mionectes</i>	E	Y	Y
Warm Springs pupfish, <i>Cyprinodon nevadensis pectoralis</i>	E	N	Y
Pahrump poolfish, <i>Empetrichthys latos</i>	E	N	Y
Desert dace, <i>Eremichthys acros</i>	T	Y	Y
Humpback chub, <i>Gila cypha</i> ^c	E	N	Y
Bonytail chub, <i>Gila elegans</i>	E	Y	Y
Pahrnagat roundtail chub, <i>Gila robusta jordani</i>	E	N	Y
Virgin River chub, <i>Gila seminuda</i> ^d	E	Y	Y
White River spinedace, <i>Lepidomeda albivallis</i>	E	Y	Y
Big Spring spinedace, <i>Lepidomeda mollispinis pratensis</i>	T	Y	Y
Moapa dace, <i>Moapa coriacea</i>	E	N	Y
Lahontan cutthroat trout, <i>Oncorhynchus clarki henshawi</i>	T	N	Y
Woundfin, <i>Plagopterus argentissimus</i>	E	Y	Y
Colorado pikeminnow, <i>Ptychocheilus lucius</i> ^c	E	N	Y

Species	Federal Status	Critical Habitat in Nevada	Recovery Plan
Independence Valley speckled dace, <i>Rhinichthys osculus lethoporus</i>	E	N	Y
Ash Meadows speckled dace, <i>R. osculus nevadensis</i>	E	Y	Y
Clover Valley speckled dace, <i>R. osculus oligoporus</i>	E	N	Y
Bull trout, <i>Salvelinus confluentus</i>	T	N	N
Razorback sucker, <i>Xyrauchen texanus</i>	E	Y	Y
Invertebrates			
Ash Meadows naucorid, <i>Ambrysus amargosus</i>	T	Y	Y
Carson wandering skipper, <i>Pseudocopaedodes eunus obscurus</i>	C	N/A	N/A
Plants			
Ash Meadows milkvetch, <i>Astragalus phoenix</i>	T	Y	Y
Spring-loving centaury, <i>Centaureum namophilum</i>	T	Y	Y
Ash Meadows sunray, <i>Enceliopsis nudicaulis</i> var. <i>corrugata</i>	T	Y	Y
Steamboat buckwheat, <i>Eriogonum ovalifolium</i> var. <i>williamsiae</i>	E	N	Y
Ash Meadows gumplant, <i>Grindelia fraxino-pratensis</i>	T	Y	Y
Ash Meadows ivesia, <i>Ivesia eremica</i> (= <i>I. kingii</i> var. <i>eremica</i>)	T	Y	Y
Ash Meadows blazing star, <i>Mentzelia leucophylla</i>	T	Y	Y
Amargosa niterwort, <i>Nitrophila mohavensis</i>	E	N	Y
Blue Diamond cholla, <i>Opuntia whipplei</i> var. <i>multigeniculata</i>	C	N/A	N/A
Tahoe yellow cress, <i>Rorippa subumbellata</i>	C	N/A	N/A
Ute lady's tresses, <i>Spiranthes diluvialis</i>	T	N	D

E = Endangered; T = Threatened; PT = Proposed Threatened; C=Candidate.

a. Uncommon transient in Nevada.

b. Proposed for delisting.

c. Believed to be extirpated from Nevada.

d. Endangered only in the Virgin River; population in Muddy River is species of concern.



United States Department of the Interior

U.S. Fish and Wildlife Service
2321 West Royal Palm Road, Suite 103
Phoenix, Arizona 85021-4951
Telephone: (602) 242-0210 FAX: (602) 242-2513



In Reply Refer To:

AESO/SE
2-21-01-I-263

April 25, 2001

Memorandum

To: Superintendent, Lake Mead National Recreation Area (NRA), Boulder City, Nevada

From: Field Supervisor

Subject: Lake Mead NRA Lake Management Plan and Environmental Impact Statement (Lake Mead and Lake Mohave)

This memorandum responds to your April 24, 2001, request for an inventory of threatened or endangered species, or those that are proposed to be listed as such under the Endangered Species Act of 1973, as amended (Act), which may potentially occur in your project area (Mohave County). The attached list may include candidate species as well. We hope the attached county list of species will be helpful. In future communications regarding this project, please refer to consultation number 2-21-01-I-263.

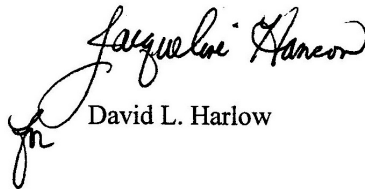
The attached list of the endangered, threatened, proposed, and candidate species includes all those potentially occurring anywhere in the county, or counties, where your project occurs. Please note that your project area may not necessarily include all or any of these species. The information provided includes general descriptions, habitat requirements, and other information for each species on the list. Also on the attached lists are the Code of Federal Regulations (CFR) citation for each list and is available at most public libraries. This information should assist you in determining which species may or may not occur within your project area. Site-specific surveys could also be helpful and may be needed to verify the presence or absence of a species or its habitat as required for the evaluation of proposed project-related impacts.

Endangered and threatened species are protected by Federal law and must be considered prior to project development. If the action agency determines that listed species or critical habitat may be adversely affected by a federally funded, permitted, or authorized activity, the action agency must request formal consultation with the Service. If the action agency determines that the planned action may jeopardize a proposed species or destroy or adversely modify proposed critical habitat, the action agency must enter into a section 7 conference with the Service. Candidate species are those which are being considered for addition to the list of threatened or endangered species. Candidate species are those for which there is sufficient information to support a proposal for listing. Although candidate species have no legal protection under the Act, we recommend that they be considered in the planning process in the event that they become listed or proposed for listing prior to project completion.

If any proposed action occurs in or near areas with trees and shrubs growing along watercourses, known as riparian habitat, the Service recommends the protection of these areas. Riparian areas are critical to biological community diversity and provide linear corridors important to migratory species. In addition, if the project will result in the deposition of dredged or fill materials into waterways or excavation in waterways, we recommend you contact the Army Corps of Engineers which regulates these activities under Section 404 of the Clean Water Act.

The State of Arizona protects some plant and animal species not protected by Federal law. We recommend you contact the Arizona Game and Fish Department and the Arizona Department of Agriculture for State-listed or sensitive species in your project area.

The Service appreciates your efforts to identify and avoid impacts to listed and sensitive species in your project area. If we may be of further assistance, please feel free to contact Tom Gatz (x240).



David L. Harlow

Attachment

cc: John Kennedy, Habitat Branch, Arizona Game and Fish Department, Phoenix, AZ

LISTED, PROPOSED, AND CANDIDATE SPECIES FOR THE FOLLOWING COUNTY:
02/26/2001

MOHAVE

1) LISTED

TOTAL= 15

NAME: ARIZONA CLIFFROSE

PURSHIA SUBINTEGRA

STATUS: ENDANGERED

CRITICAL HAB No RECOVERY PLAN: Yes CFR: 49 FR 22326 5-29-84

DESCRIPTION: EVERGREEN SHRUB OF THE ROSE FAMILY (ROSEACEAE). BARK PALE

SHREDDY. YOUNG TWIGGS WITH DENSE HAIRS. LEAVES 1-5 LOBES AND

EDGES CURL DOWNWARD (REVOLUTE). FLOWERS: 5 WHITE OR YELLOW

PETALS <0.5 INCH LONG.

ELEVATION

RANGE: <4000 FT.

COUNTIES: GRAHAM YAVAPAI MARICOPA MOHAVE

HABITAT: CHARACTERISTIC WHITE SOILS OF TERTIARY LIMESTONE LAKEBED DEPOSITS.

WHITE SOILS OF TERTIARY LIMESTONE LAKEBED DEPOSITS CAN BE SEEN FROM A DISTANCE.

NAME: JONES' CYCLADENIA

CYCLADENIA HUMILIS VAR JONESII

STATUS: THREATENED

CRITICAL HAB No RECOVERY PLAN: No CFR: 51 FR 16530

DESCRIPTION: A LONG LIVED PERENNIAL HERB IN THE DOGBANE FAMILY

(Apocynaceae) WITH PINKISH-ROSE FLOWERS. PLANTS REACH 4-6

INCHES TALL AND HAVE ORBICULAR, WIDE-OVAL OR ELLIPTICAL

LEAVES. PLANTS OVER WINTER AS SUBTERRANEAN RHIZOMES (roots).

ELEVATION

RANGE: 4390-6000 FT.

COUNTIES: MOHAVE

HABITAT: MIXED DESERT SCRUB, JUNIPER, OR WILD BUCKWHEAT-MORMON TEA

IT IS FOUND ON GYPSIFEROUS, SALINE SOILS OF THE CUTLER, SUMMERVILLE, AND CHINLE FORMATIONS.

NAME: SILER PINCUSHION CACTUS

PEDIOCACTUS SILERI

STATUS: THREATENED

CRITICAL HAB No RECOVERY PLAN: Yes CFR: 44 FR 61786, 11-26-1979

DESCRIPTION: SMALL SOLITARY OR CLUSTERED CACTUS GLOBOSE SHAPED ABOUT 5

INCHES TALL AND 3-4 INCHES IN DIAMETER. FLOWERS: YELLOW WITH

MAROON VEINS

ELEVATION

RANGE: 2800-5400 FT.

COUNTIES: MOHAVE COCONINO

HABITAT: DESERTSCRUB TRANSITIONAL AREAS OF NAVAJO, SAGEBRUSH AND MOHAVE DESERTS

GROWS ON GYPSIFEROUS CLAY AND SANDY SOILS OF MOENKOPI FORMATION.

LISTED, PROPOSED, AND CANDIDATE SPECIES FOR THE FOLLOWING COUNTY:

MOHAVE

02/26/2001

NAME: DESERT TORTOISE, MOHAVE POPULATION *GOPHERUS AGASSIZII* [XEROBATES]

STATUS: THREATENED CRITICAL HAB Yes RECOVERY PLAN: Yes CFR: 55 FR 12178, 04-02-1990;
 DESCRIPTION: LARGE HERBIVOROUS REPTILE HAS DOMED SHELL AND ROUND 59 FR 5820, 2-08-94
 STUMPY HIND LEGS. MOST ACTIVE DURING THE SPRING WHEN PLANTS
 ARE MOST ABUNDANT. SOME ACTIVITY IN LATE SUMMER FOLLOWING
 MONSOONS. REMAINDER OF YEAR SPENT IN BURROWS. ELEVATION
 RANGE: 500-5100 FT.

COUNTIES: MOHAVE

HABITAT: MOHAVE DESERT SCRUB NORTH & WEST OF THE COLORADO RIVER

HABITAT RANGES FROM FLATLANDS TO ROCKY SLOPES AND BAJADAS. SPECIES STILL FOUND THROUGHOUT
 RANGE, BUT POPULATIONS ARE FRAGMENTED AND DECLINING. THE SONORAN DESERT POPULATION (FOUND
 SOUTH AND EAST OF THE COLORADO RIVER) WAS CONSIDERED A CATEGORY 2 CANDIDATE BUT CURRENTLY HAS
 NO STATUS.

NAME: HUALAPAI MEXICAN VOLE

MICROTUS MEXICANUS HUALPAIENSIS

STATUS: ENDANGERED CRITICAL HAB No RECOVERY PLAN: Yes CFR: 52 FR 36776, 10-01-87
 DESCRIPTION: SMALL, CINNAMON-BROWN MOUSE-SIZED WITH SHORT TAIL AND LONG
 FUR THAT NEARLY COVERS ITS SMALL ROUND EARS.

ELEVATION
 RANGE: 3500-7000 FT.

COUNTIES: MOHAVE

HABITAT: GRASS/FORB HABITATS IN PONDEROSA PINE, TYPICALLY NEAR WATER. (CONTINUED BELOW)

ALSO FOUND IN PINYON-JUNIPER & PINE-OAK ASSOCIATIONS WITH A VARIETY OF SHRUBS AND GRASSES.
 SPECIES CONFIRMED ONLY IN THE HUALAPAI MOUNTAIN RANGE AND POSSIBLY IN THE PROSPECT VALLEY AND
 MUSIC MOUNTAINS. ONGOING RESEARCH SUGGESTS THAT POPULATIONS MAY OCCUR IN THE HUALAPAI NATION,
 AUBREY CLIFFS, CHINO WASH, SANTA MARIA MOUNTAINS, BRADSHAW MOUNTAINS, ROUND MOUNTAIN, AND
 SIERRA PRIETA MOUNTAINS. THE TAXON MAY ULTIMATELY BE RENAMED.

NAME: BONYTAIL CHUB

GILA ELEGANS

STATUS: ENDANGERED CRITICAL HAB Yes RECOVERY PLAN: Yes CFR: 45 FR 27710, 04-23-1980;
 DESCRIPTION: LARGE (12-14 UP TO 24 INCHES) MINNOW CHARACTERIZED BY SMALL 59 FR 13374, 03-21-1994
 HEAD LARGE FINS SLIGHTLY HUMPED BACK AND LONG THIN CAUDAL
 PEDUNCLE.

ELEVATION
 RANGE: <4000 FT.

COUNTIES: MOHAVE, LA PAZ

HABITAT: WARM SWIFT TURBID MAINSTEM RIVERS OF THE COLORADO RIVER BASIN, RESERVOIRS IN LOWER BASIN

ENDEMIC TO COLORADO RIVER BASIN. RAREST OF COLORADO RIVER FISH. POPULATION AUGMENTATION IS
 ONGOING IN LAKE MOHAVE AND LAKE HAVASU.

LISTED, PROPOSED, AND CANDIDATE SPECIES FOR THE FOLLOWING COUNTY:

MOHAVE

02/26/2001

NAME: HUMPBACK CHUB

GILA CYPHA

STATUS: ENDANGERED

CRITICAL HAB Yes RECOVERY PLAN: Yes CFR: 32 FR 4001, 03-11-1967;59

DESCRIPTION: LARGE (18 INCH) MINNOW FLATTENED HEAD LONG FLESHY SNOUT,
LARGE FINS, AND A VERY LARGE HUMP BETWEEN THE HEAD AND THE
DORSAL FIN

FR 13374, 03-21-1994

ELEVATION

RANGE: <4000 FT.

COUNTIES: COCONINO, MOHAVE

HABITAT: LARGE WARM TURBID RIVERS ESPECIALLY CANYON AREAS WITH DEEP FAST WATER

CRITICAL HABITAT IN GRAND CANYON

NAME: RAZORBACK SUCKER

XYRAUCHEN TEXANUS

STATUS: ENDANGERED

CRITICAL HAB Yes RECOVERY PLAN: Yes CFR: 55 FR 21154, 05-22-1990;

DESCRIPTION: LARGE (UP TO 3 FEET AND UP TO 16 POUNDS) LONG, HIGH SHARP-
EDGED KEEL-LIKE HUMP BEHIND THE HEAD. HEAD FLATTENED ON TOP.
OLIVE-BROWN ABOVE TO YELLOWISH BELOW.

59 FR 13374, 03-21-1994

ELEVATION

RANGE: <6000 FT.

COUNTIES: GREENLEE, MOHAVE, PINAL, YAVAPAI, YUMA, LA PAZ, MARICOPA (REFUGIA), GILA, COCONINO, GRAHAM

HABITAT: RIVERINE & LACUSTRINE AREAS, GENERALLY NOT IN FAST MOVING WATER AND MAY USE BACKWATERS

SPECIES IS ALSO FOUND IN HORSESHOE RESERVOIR (MARICOPA COUNTY). CRITICAL HABITAT INCLUDES THE 100-YEAR FLOODPLAIN OF THE RIVER THROUGH GRAND CANYON FROM CONFLUENCE WITH PARIA RIVER TO HOOVER DAM; HOOVER DAM TO DAVIS DAM; PARKER DAM TO IMPERIAL DAM. ALSO GILA RIVER FROM AZ/NM BORDER TO COOLIDGE DAM; AND SALT RIVER FROM HWY 60/SR 77 BRIDGE TO ROOSEVELT DAM; VERDE RIVER FROM FS BOUNDARY TO HORSESHOE LAKE.

NAME: VIRGIN RIVER CHUB

GILA SEMINUDA

STATUS: ENDANGERED

CRITICAL HAB Yes RECOVERY PLAN: Yes CFR: 54 FR 35305, 08-24-1989;

DESCRIPTION: SLENDER, SILVERY MINNOW (8-18 INCHES), WITH SMALL EMBEDDED
SCALES GIVING A SMOOTH APPEARANCE TO THE BODY.

60 FR 17296, 04-05-1995

ELEVATION

RANGE: <4,500 ft FT.

COUNTIES: MOHAVE (AZ), WASHINGTON (UT), AND CLARK (NV)

HABITAT: DEEP SWIFT WATERS BUT NOT TURBULENT SAND & GRAVEL WITH BOULDERS OR INSTREAM COVER

PROPOSED CRITICAL HABITAT MAIN CHANNEL OF THE VIRGIN RIVER AND ITS 100-YEAR FLOODPLAIN. PRESENTLY FOUND IN THE VIRGIN AND MOAPA (=MUDDY) RIVERS AND THE MOUTH OF BEAVER DAM WASH.

LISTED, PROPOSED, AND CANDIDATE SPECIES FOR THE FOLLOWING COUNTY:
02/26/2001

MOHAVE

NAME: WOUNDFIN

PLAGOPTERUS ARGENTISSIMUS

STATUS: ENDANGERED

CRITICAL HAB Yes RECOVERY PLAN: Yes CFR: 35 FR 16047, 10-13-1970;

DESCRIPTION: SMALL (4 INCHES) SILVER MINNOW WITH FAIRLY LARGE FINS AND A
SHARP DORSAL FIN SPINE.

60 FR 17296, 04-05-1995

ELEVATION

RANGE: <4500 FT.

COUNTIES: MOHAVE (AZ), WASHINGTON (UT), AND CLARK (NV)

HABITAT: RUNS AND QUIET WATERS ADJACENT TO RIFFLES OVER SAND AND GRAVEL SUBSTRATES

EXPERIMENTAL POPULATIONS (50 FR 30193, 07-24-1985) DESIGNATED, BUT NOT YET INTRODUCED IN PORTIONS OF VERDE, GILA, SAN FRANCISCO, AND HASSAYAMPA RIVERS AND TONTO CREEK. PROPOSED CRITICAL HABITAT ON VIRGIN RIVER AND ITS 100-YEAR FLOODPLAIN.

NAME: BALD EAGLE

HALIAEETUS LEUCOCEPHALUS

STATUS: THREATENED

CRITICAL HAB No RECOVERY PLAN: Yes CFR: 60 FR 35999, 07-12-95

DESCRIPTION: LARGE, ADULTS HAVE WHITE HEAD AND TAIL. HEIGHT 28 - 38";
WINGSPAN 66 - 96". 1-4 YRS DARK WITH VARYING DEGREES OF
MOTTLED BROWN PLUMAGE. FEET BARE OF FEATHERS.

ELEVATION

RANGE: VARIES FT.

COUNTIES: YUMA, LA PAZ, MOHAVE, YAVAPAI, MARICOPA, PINAL, COCONINO, NAVAJO, APACHE, SANTA CRUZ, PIMA,
GILA, GRAHAM, COCHISE

HABITAT: LARGE TREES OR CLIFFS NEAR WATER (RESERVOIRS, RIVERS AND STREAMS) WITH ABUNDANT PREY

SOME BIRDS ARE NESTING RESIDENTS WHILE A LARGER NUMBER WINTERS ALONG RIVERS AND RESERVOIRS. AN ESTIMATED 200 TO 300 BIRDS WINTER IN ARIZONA. ONCE ENDANGERED (32 FR 4001, 03-11-1967; 43 FR 6233, 02-14-78) BECAUSE OF REPRODUCTIVE FAILURES FROM PESTICIDE POISONING AND LOSS OF HABITAT, THIS SPECIES WAS DOWN LISTED TO THREATENED ON AUGUST 11, 1995. ILLEGAL SHOOTING, DISTURBANCE, LOSS OF HABITAT CONTINUES TO BE A PROBLEM. SPECIES HAS BEEN PROPOSED FOR DELISTING (64 FR 36454) BUT STILL RECEIVES FULL PROTECTION UNDER ESA.

NAME: CALIFORNIA CONDOR

GYMNOPS CALIFORNIANUS

STATUS: EXPERIMENTAL/NONESENTIAL CRITICAL HAB No RECOVERY PLAN: Yes CFR: 32 FR 4001; 03-11-67

DESCRIPTION: VERY LARGE VULTURE (47 IN., WINGSPAN TO 9 1/2 FT, WEIGHT TO 22
LBS); ADULT PLUMAGE BLACKISH, IMMATURE MORE BROWNISH; ADULT
WING LININGS WHITE, IMMATURE MOTTLED; HEAD & UPPER PARTS OF
NECK BARE; YELLOW-ORANGE IN ADULTS, GRAYISH IN IMMATURE.

ELEVATION

RANGE: VARIES FT.

COUNTIES: MOHAVE, COCONINO, NAVAJO, APACHE

HABITAT: HIGH DESERT CANYONLANDS AND PLATEAUS

LAST WILD CONDOR REPORTED IN ARIZONA IN 1924. RECOVERY PROGRAM HAS REINTRODUCED CONDORS TO NORTHERN ARIZONA, WITH THE FIRST RELEASE (6 BIRDS) IN DECEMBER 1996. RELEASE SITE LOCATED AT THE VERMILLION CLIFFS (COCONINO CO.), WITH AN EXPERIMENTAL/NONESENTIAL AREA DESIGNATED FOR MOST OF NORTHERN ARIZONA AND SOUTHERN UTAH.

LISTED, PROPOSED, AND CANDIDATE SPECIES FOR THE FOLLOWING COUNTY:

MOHAVE

02/26/2001

NAME: MEXICAN SPOTTED OWL

STRIX OCCIDENTALIS LUCIDA

STATUS: THREATENED

CRITICAL HAB Yes RECOVERY PLAN: Yes CFR: 56 FR 14678, 04-11-91; 66

DESCRIPTION: MEDIUM SIZED WITH DARK EYES AND NO EAR TUFTS. BROWNISH AND
HEAVILY SPOTTED WITH WHITE OR BEIGE.

FR 8530, 2/1/01

ELEVATION

RANGE: 4100-9000 FT.

COUNTIES: MOHAVE, COCONINO, NAVAJO, APACHE, YAVAPAI, GRAHAM, GREENLEE, COCHISE, SANTA CRUZ, PIMA,
PINAL, GILA, MARICOPA

HABITAT: NESTS IN CANYONS AND DENSE FORESTS WITH MULTI-LAYERED FOLIAGE STRUCTURE

GENERALLY NESTS IN OLDER FORESTS OF MIXED CONIFER OR PONDEROSA PINE/GAMBEL OAK TYPE, IN CANYONS, AND USE VARIETY OF HABITATS FOR FORAGING. SITES WITH COOL MICROCLIMATES APPEAR TO BE OF IMPORTANCE OR ARE PREFERRED. CRITICAL HABITAT WAS REMOVED IN 1998 BUT RE-PROPOSED IN JULY 2000 AND FINALIZED IN FEB 2001 FOR APACHE, COCHISE, COCONINO, GRAHAM, MOHAVE, PIMA COUNTIES; ALSO IN NEW MEXICO, UTAH, AND COLORADO.

NAME: SOUTHWESTERN WILLOW FLYCATCHER

EMPIDONAX TRAILLII EXTIMUS

STATUS: ENDANGERED

CRITICAL HAB Yes RECOVERY PLAN: No CFR: 60 FR 10694, 02-27-95

DESCRIPTION: SMALL PASSERINE (ABOUT 6") GRAYISH-GREEN BACK AND WINGS,
WHITISH THROAT, LIGHT OLIVE-GRAY BREAST AND PALE YELLOWISH
BELLY. TWO WINGBARS VISIBLE. EYE-RING FAINT OR ABSENT.

ELEVATION

RANGE: <8500 FT.

COUNTIES: YAVAPAI, GILA, MARICOPA, MOHAVE, COCONINO, NAVAJO, APACHE, PINAL, LA PAZ, GREENLEE, GRAHAM,
YUMA, PIMA, COCHISE, SANTA CRUZ

HABITAT: COTTONWOOD/WILLOW & TAMARISK VEGETATION COMMUNITIES ALONG RIVERS & STREAMS

MIGRATORY RIPARIAN OBLIGATE SPECIES THAT OCCUPIES BREEDING HABITAT FROM LATE APRIL TO SEPTEMBER. DISTRIBUTION WITHIN ITS RANGE IS RESTRICTED TO RIPARIAN CORRIDORS. DIFFICULT TO DISTINGUISH FROM OTHER MEMBERS OF THE EMPIDONAX COMPLEX BY SIGHT ALONE. TRAINING SEMINAR REQUIRED FOR THOSE CONDUCTING FLYCATCHER SURVEYS. CRITICAL HABITAT ON PORTIONS OF THE 100-YEAR FLOODPLAIN ON SAN PEDRO AND VERDE RIVERS; WET BEAVER AND WEST CLEAR CREEKS, INCLUDING TAVASCI MARSH AND ISTER FLAT; THE COLORADO RIVER, THE LITTLE COLORADO RIVER, AND THE WEST, EAST, AND SOUTH FORKS OF THE LITTLE COLORADO RIVER, REFERENCE 60 CFR:62 FR 39129, 7/22/97.

NAME: YUMA CLAPPER RAIL

RALLUS LONGIROSTRIS YUMANENSIS

STATUS: ENDANGERED

CRITICAL HAB No RECOVERY PLAN: Yes CFR: 32 FR 4001, 03-11-67; 48

DESCRIPTION: WATER BIRD WITH LONG LEGS AND SHORT TAIL. LONG SLENDER
DECURVED BILL. MOTTLED BROWN ON GRAY ON ITS RUMP. FLANKS
AND UNDERSIDES ARE DARK GRAY WITH NARROW VERTICAL STRIPES
PRODUCING A BARRING EFFECT.

ELEVATION

RANGE: <4500 FT.

COUNTIES: YUMA, LA PAZ, MARICOPA, PINAL, MOHAVE

HABITAT: FRESH WATER AND BRACKISH MARSHES

SPECIES IS ASSOCIATED WITH DENSE EMERGENT RIPARIAN VEGETATION. REQUIRES WET SUBSTRATE (MUDFLAT, SANDBAR) WITH DENSE HERBACEOUS OR WOODY VEGETATION FOR NESTING AND FORAGING. CHANNELIZATION AND MARSH DEVELOPMENT ARE PRIMARY SOURCES OF HABITAT LOSS.

LISTED, PROPOSED, AND CANDIDATE SPECIES FOR THE FOLLOWING COUNTY:
02/26/2001

MOHAVE

2) PROPOSED

TOTAL= 1

NAME: HOLMGREN MILK-VETCH

ASTRAGALUS HOLMGRENII

STATUS: PROPOSED ENDANGERED CRITICAL HAB No RECOVERY PLAN: No CFR: 65 FR 19728

DESCRIPTION: DWARF PERENNIAL HERB. NO STEM LEAVES AND FLOWERS: PROSTRATE
FROM ROOT. FLOWERS PURPLE, SEEDS: CURVED, ELLIPTIC, AND HAVE
BEAK AT THE TIP. LEAVES: BLUE-GREEN BELOW AND YELLOWISH-
GREEN ABOVE

ELEVATION
RANGE: 2700-2800 FT.

COUNTIES: MOHAVE

HABITAT: JUST UNDER LIMESTONE RIDGES AND ALONG DRAWS IN GRAVELLY CLAY HILLS

TWO ADDITIONAL POPULATIONS KNOWN NEAR ST. GEORGE, UTAH. SPECIES ALSO KNOWN AS PARADOX MILK-VETCH.

LISTED, PROPOSED, AND CANDIDATE SPECIES FOR THE FOLLOWING COUNTY:
02/26/2001

MOHAVE

3) CANDIDATE

TOTAL= 1

NAME: FICKEISEN PINCUSHION CACTUS

PEDIOCACTUS PEEBLESIANUS FICKEISENIAE

STATUS: CANDIDATE

CRITICAL HAB No RECOVERY PLAN: No CFR:

DESCRIPTION: VERY SMALL (3 INCHES TALL- 1.5 INCHES DIAMETER) UNBRANCHED
CACTUS THAT RETREATS INTO GRAVELY SOILS AFTER FLOWERING
AND FRUITING. TUBERCLES FORM A SPIRAL PATTERN AROUND PLANT.
CENTRAL SPINE 3/8 INCH LONG FLOWERS CREAM/YELLOW

ELEVATION

RANGE: 4000-5000 FT.

COUNTIES: COCONINO, MOHAVE

HABITAT: EXPOSED LAYERS OF KAIBAB LIMESTONE ON CANYON MARGINS OR HILLS OF NAVAJOAN DESERT

LISTED, PROPOSED, AND CANDIDATE SPECIES FOR THE FOLLOWING COUNTY:
02/26/2001

MOHAVE

CONSERVATION AGREEMENT

TOTAL= 1

NAME: VIRGIN SPINEDACE

LEPIDOMEDA MOLLISPINIS MOLLISPINIS

STATUS: CONSERVATION AGREEMENT CRITICAL HAB No RECOVERY PLAN: No CFR:

DESCRIPTION: SMALL FISH, ABOUT 5 INCHES, ROUNDED SNOUT; LARGE TERMINAL
MOUTH WITH TWO LARGE SPINES AT FRONT OF DORSAL FIN;
COMPRESSED BODY WITH GRAY-BLACK BLOTCHES AND SPECKS

ELEVATION
RANGE: <4,500 FEE FT.

COUNTIES: MOHAVE (AZ), WASHINGTON (UT), CLARK (NV)

HABITAT: AQUATIC

CONSERVATION AGREEMENT BETWEEN THE SERVICE, UTAH DIVISION OF WILDLIFE RESOURCES, WASHINGTON
COUNTY WATER CONSERVANCY DISTRICT, AND OTHERS FINALIZED IN 1995



United States Department of the Interior

FISH AND WILDLIFE SERVICE
NEVADA FISH AND WILDLIFE OFFICE
1340 FINANCIAL BOULEVARD, SUITE 234
RENO, NEVADA 89502

May 24, 2001
File No. 1-5-01-SP-504

Mr. William K. Dickinson
Lake Mead National Recreation Area
601 Nevada Highway
Boulder City, Nevada 89005

Dear Mr. Dickinson:

Subject: Species List for the Proposed Lake Mead National Recreation Area Lake Management Plan and Environmental Impact Statement

This responds to your letter dated April 24, 2001, requesting information regarding threatened and endangered species and species of concern for the proposed area to be covered by the Lake Management Plan (Plan) and Environmental Impact Statement. We have enclosed a list of threatened and endangered species that may be present within the vicinity of the proposed Plan area (Enclosure A). This list fulfills the requirement of the Fish and Wildlife Service (Service) to provide information on listed species pursuant to section 7(c) of the Endangered Species Act of 1973, as amended, for projects that are authorized, funded, or carried out by a Federal agency. Please reference the file number on Enclosure A in all subsequent correspondence concerning this project.

Enclosure A also lists the species of concern to the Nevada Fish and Wildlife office that may occur in the Plan area. We have used information from State and Federal agencies and private sources to assess the conservation needs and status of these species. Further biological research and field study are needed to resolve the conservation status of these taxa. One potential benefit of considering these species during project planning, is that by exploring alternatives early in the planning process, it may be possible to provide long-term conservation benefits for these species and avoid future conflicts that could otherwise develop. We also recommend that you contact the Nevada Natural Heritage Program (1550 East College Parkway, Suite 145, Carson City, Nevada 89710, 775-687-4245) and the appropriate regional office of the Nevada Division of Wildlife, as well as other local, State, and Federal agencies for distribution data and information on conservation needs on these and other species of concern that may occur in the Plan area. Potential impacts to species of concern should be considered during the environmental documentation process.

Mr. William K. Dickinson

File No. 1-5-01-SP-504

Enclosure B provides a discussion of the responsibilities Federal agencies have under section 7(c) of the Act and the conditions under which a biological assessment must be prepared by the lead Federal agency or its designated non-Federal representative. If the proposed project is authorized, funded, or carried out by a Federal agency, and if it is determined that a listed species may be affected by the proposed projects, the Federal agency should initiate consultation pursuant to 50 CFR § 402.14. Informal consultation may be utilized prior to a written request for formal consultation to exchange information and resolve conflicts with respect to a listed species. If a biological assessment is required, and it is not initiated within 90 days of your receipt of this letter, you should informally verify the accuracy of this list with our office. If, through informal consultation or development of a biological assessment, or both, you determine that the proposed action is not likely to adversely affect the listed species, and the Service concurs in writing, then the consultation process is terminated and formal consultation is not required.

We agree that recreational impacts, including the environmental impacts of boating, should be addressed within the Plan. Boating activities have a biological, physical, and chemical effect on the surrounding environment. As the use of our nations waterways for recreation increases, so will the negative impacts, such as coliform bacteria released illegally from houseboats, disturbance to fauna that utilize Lake Mead NRA, and release of chemical contaminants from boat emissions. To assist in addressing recreation boating within the Plan, we recommend a review of the following technical report "The Environmental Impacts of Boating; Proceedings of a Workshop held at Woods Hole Oceanographic Institution, Woods Hole, MA, USA, December 7 to 9, 1994" (WHOI-98-03). The report includes an extensive bibliography of published literature and unpublished reports pertinent to boating impacts. If a copy cannot be obtained from the referenced source, please contact our office for a copy.

Please contact Debi Johnson or Erik L. Orsak of the Southern Nevada Field Office, at 702-647-5230, if you have questions regarding this correspondence.

Sincerely,



Robert D. Williams
46/ Field Supervisor

Enclosures

ENCLOSURE A

**LISTED SPECIES AND SPECIES OF CONCERN
WITHIN THE AREA PROPOSED TO BE COVERED
UNDER THE LAKE MEAD NATIONAL RECREATION AREA
LAKE MANAGEMENT PLAN**

File Number: 1-5-01-SP-504

May 24, 2001

Listed Species**Reptile**

Desert tortoise (T)

*Gopherus agassizii***Fish**

Bonytail chub (E)

Gila elegans

Virgin River chub (E)

Gila seminuda

Woundfin (E)

Plagopterus argentissimus

Razorback sucker (E)

Xyrauchen texanus

 T = Threatened, E = Endangered
Species of Concern**Reptiles**

Banded Gila monster

Heloderma suspectum cinctum

Chuckwalla

*Sauromalus obesus***Fish**

Flannelmouth sucker

*Catostomus latipinnis***Amphibian**

Relict leopard frog

*Rana onca***Birds**

Western burrowing owl

Athene cunicularia hypugea

American peregrine falcon

Falco peregrinus anatum

Blue grosbeak

Guiraca caerulea

Phainopepla

Phainopepla nitens

Lucy's warbler

Vermivora luciae

ENCLOSURE A (cont)

File Number: 1-5-01-SP-504

May 24, 2001

Mammals

Pale Townsend's big-eared bat
Spotted bat
Greater western mastiff-bat
Allen's big-eared bat
California leaf-nosed bat
Small-footed myotis
Long-eared myotis
Fringed myotis
Cave myotis
Long-legged myotis
Big free-tailed bat

Corynorhinus townsendii pallescens
Euderma maculatum
Eumops perotis californicus
Idionycteris phyllotis
Macrotus californicus
Myotis ciliolabrum
Myotis evotis
Myotis thysanodes
Myotis velifer
Myotis volans
Nyctinomops macrotis

Plants

Las Vegas bearpoppy
Sticky ringstem
Las Vegas bearpoppy
Threecorner milkvetch
Sticky buckwheat
Beaver Dam scurfpea

Arctomecon californica
Anulocaulis leiosolenus
Arctomecon californica
Astragalus geyeri var. *triquetrus*
Eriogonum viscidulum
Pediomelum castoreum

ENCLOSURE B

FEDERAL AGENCIES' RESPONSIBILITIES UNDER SECTIONS 7 (a) and (c) OF THE ENDANGERED SPECIES ACT

SECTION 7 (a); Consultation/Conference

Requires:

- 1) Federal agencies to utilize their authorities to carry out programs to conserve **endangered and threatened species**;
- 2) Consultation with the Fish and Wildlife Service (Service) when a Federal action may affect a listed endangered or threatened species to insure that any action authorized, funded or carried out by a Federal agency is not likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of critical habitat. The process is initiated by the Federal agency after determining the action may affect a listed species or critical habitat;
- 3) Conference with the Service when a Federal action is likely to jeopardize the continued existence of a proposed species or result in destruction or adverse modification of proposed critical habitat.

SECTION 7 (c): Biological Assessment - Major Construction Activity 1/

Requires Federal agencies or their designees to prepare a Biological Assessment (BA) for major construction activities. The BA analyzes the effects of the action on listed and proposed species. The process begins with a Federal agency requesting from the Service a list of proposed and listed threatened and endangered species. The BA should be completed within 180 days after its initiation (or within such a time period as is mutually agreeable). If the BA is not initiated within 90 days of receipt of the list, the accuracy of the species list should be informally verified with the Service. No irreversible commitment of resources is to be made during the BA process which would foreclose reasonable and prudent alternatives to protect endangered species. Planning, design, and administrative actions may proceed; however, no construction may begin.

We recommend the following for inclusion in the BA:

1. An onsite inspection of the area affected by the proposal which may include a detailed survey of the area to determine if the species or suitable habitat are present.

2. A review of literature and scientific data to determine species distribution, habitat needs, and other biological requirements.
3. Interviews with experts, including those within the Service, State conservation departments, universities, and others who may have data not yet published in scientific literature.
4. An analysis of the effects of the proposal on the species in terms of individuals and populations, including consideration of cumulative effects of the proposal on the species and its habitat.
5. An analysis of alternative actions considered.
6. Documentation of study results, including a discussion of study methods used, any problems encountered, and other relevant information.
7. Conclusion as to whether or not a listed or proposed species will be affected.

Upon completion, the BA should be forwarded to our office with a request for consultation, if required.

^{1/} A construction project (or other major undertaking having similar physical impacts) is a major Federal action significantly affecting the quality of the human environment as referred to in NEPA (42 U.S.C. 4332 (2) C).



United States Department of the Interior

U.S. Fish and Wildlife Service
Arizona Ecological Services Field Office
2321 West Royal Palm Road, Suite 103
Phoenix, Arizona 85021-4951

Telephone: (602) 242-0210 Fax: (602) 242-2513



In Reply Refer to:

AESO/SE
02-21-01-F-0263

October 7, 2002

Memorandum

To: Superintendent, Lake Mead National Recreation Area, National Park Service,
Boulder City, Nevada

From: *ACTING*
Field Supervisor

Subject: Lake Mead National Recreation Area Lake Management Plan

Thank you for your request for consultation with the U.S. Fish and Wildlife Service (FWS) pursuant to section 7 of the Endangered Species Act of 1973 (16 U.S.C. 1531-1544), as amended (Act). Your request for formal consultation dated April 24, 2002, was received by us on April 29, 2002. At issue are impacts that may result from the National Park Service's (NPS) proposed Lake Management Plan (LMP) for the Lake Mead National Recreation Area (NRA) in Mohave County, Arizona and Clark County, Nevada. The species of concern in this consultation are the endangered southwestern willow flycatcher (*Empidonax traillii extimus*), bonytail chub (*Gila elegans*), razorback sucker (*Xyrauchen texanus*) and threatened desert tortoise (*Gopherus agassizii*). Critical habitat for the bonytail chub in Lake Mohave and for the razorback sucker in Lake Mead and Lake Mohave has been designated. Critical habitat for the desert tortoise in Nevada has been designated and includes upland habitats adjacent to portions of the lakes.

In your memorandum, you requested our concurrence that the proposed action was not likely to adversely affect the endangered bald eagle (*Haliaeetus leucocephalus*) and the Yuma clapper rail (*Rallus longirostris yumanensis*). We concur with these findings. The rationale for our concurrence for these species is given in Appendix A to this document.

This biological opinion is based on information provided in the April, 2002 draft Environmental Impact Statement (DEIS) for the LMP, your memorandum dated April 24, 2002 requesting formal consultation, your memorandum of July 31, 2002 with changes to the proposed action and conservation measures, the FWS' October 18, 2001, draft programmatic guidance on programmatic consultations, and other sources of information. Literature cited in this biological opinion is not a complete bibliography of all literature available on the species of concern, effects of recreational activities, or other subjects considered in this biological opinion. A complete administrative record of this consultation is on file in this office.

Consultation History

April 24, 2001: NPS requests species list. We respond on April 25, 2002.

February 21, 2002: NPS provides preliminary copy of DEIS to us for endangered species review.

March 21, 2002: We provide comments to NPS on preliminary DEIS.

April 24, 2002: NPS requests formal consultation.

April 29, 2002: Formal consultation initiated. Letter to NPS dated May 9, 2002.

May 13, 2002: Summary of action sent to NPS. Comments were received June 21, 2002.

July 15, 2002: Meeting with Phoenix and Las Vegas FWS Offices and NPS to discuss progress of consultation and additional conservation measures.

July 31, 2002: NPS provides documentation of additional conservation measures and minor changes to the proposed action.

September 9, 2002: NPS requests consultation be suspended until October 7, 2002.

BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

The NRA contains 1,501,216 acres of land in Nevada and Arizona, of which 1,484,159 acres are in Federal ownership administered by the NPS. The LMP encompasses two constructed reservoirs on the Colorado River in Arizona and Nevada including the 157,900 surface acres and over 700 miles of shoreline of Lake Mead and 28,260 surface acres and 150 miles of shoreline of Lake Mohave. The project area also includes the existing roads within the NRA used to access the shoreline of the lakes. The LMP replaces the General Management Plan finalized in 1986. The 1986 plan does not have Act compliance for species listed since that time. The LMP will guide recreational use, facilities development and operation, monitoring needs and other management actions as described in the Draft Environmental Impact Statement (DEIS) (NPS 2002a). The full text of the proposed action is contained in the DEIS and is incorporated into this BO by reference. Some minor changes to the proposed action were documented in the July 31, 2002, NPS memorandum to the FWS (NPS 2002b). The following is a summary of the proposed action, Alternative C with the changes from the July 31, 2002 memorandum.

Site Specific Actions

The LMP provides for a range of recreational opportunities on the lakes and different recreational opportunity zones are delineated (Urban Park, Urban Natural, Rural Natural, Semi-primitive and Primitive) to establish acceptable uses. The Urban Park, Urban Natural and Rural Natural zones dominate the area. Recreational uses within the urban and rural zones includes boating, (sail, power, personal watercraft, canoe/kayak), fishing, waterskiing, SCUBA, swimming and camping. Not all activities are permitted everywhere within the zones; please see the DEIS for specific restrictions especially within the Urban Park zones that relate to shoreline zoning in specific areas. In Lake Mead, there would be no Primitive designation. The Semi-primitive zone would include the Virgin River inflow area, Bonelli Bay, Gypsum Beds and Grand Wash Bay. In the Semi-primitive zones, boats operating at wakeless speed would be allowed but personal watercraft would not. In Lake Mohave, the reach above Willow Beach would be operated as Rural Natural during the summer months, with houseboats, water-skiing and wake-boarding prohibited. Between Labor Day and Memorial Day, the zoning would change to Semi-primitive for 5 days each week with restrictions on boat motor horsepower. The remaining 2 days a week the zoning would be Primitive with non-motorized use only allowed. A 200-foot no-wake area would be established around beaches frequented by swimmers, boats at the shoreline, and anglers or other people at the shoreline or in the water. Existing no-wake zones would be retained under the proposed action.

The proposed action includes the existing recreational facilities along the shoreline, expansion to some of these facilities, and new facilities. Facilities include marinas with a variety of services offered, public boat launch ramps and parking, campgrounds (developed and undeveloped) and sanitation facilities. Provision for a maximum recreational capacity of 1,670 boats at one time (BAOT) for Lake Mohave and 3,295 BAOT for Lake Mead is part of the proposed action. This is an increase over the existing level of use, but is less than that included in the 1986 General Management Plan.

Existing marina and boat launch facilities, including the number of single and double (pull-through) parking spaces are detailed in the LMP. The proposed action includes the operations of these existing facilities into the future. Some expansion of facilities is also included. Tables 1 and 2 contain a summary of the marina and public launch facilities included in the LMP. Most of the existing facilities are not covered by section 7 consultations. There are two exceptions. The Willow Beach developed area on Lake Mohave was informally consulted on in 1993 (consultation number 2-21-90-I-168b) and NPS made a finding of “no effect” to listed species from renovation and continuation of operations at that facility. An expansion of fishing access at the Echo Bay developed area was informally consulted on in 2000 (consultation number 1-5-01-I-418) and the FWS concurred with a finding of “may affect, not likely to adversely affect” listed species. The presence of all existing facilities in the NRA is included in the environmental baseline with future operations part of the effects of the action. For the purposes of this consultation, the existing level, not the present authorized level of these facilities under the 1986 plan, is included as part of the proposed action.

The proposed action does not call for the development of any new access roads or expansions in the size of existing roads. These existing roads are in the environmental baseline, with the

continued use of the roads part of the effects of the action. Recent consultations on new entrance stations for the NRA (2-21-95-I-034 and VEGAS #) exist. New stations constructed under those consultations are part of the environmental baseline.

Other shoreline recreational facilities include developed and undeveloped campgrounds and day use areas. Minor facilities enhancement for these sites include additional parking areas, limited paving of roads and similar actions. A permit system may be set up for some shoreline camping areas.

Within the proposed action there are several specific actions that apply to the entire lake and shoreline area but are not entirely site specific. These actions include sanitation and litter control and water quality monitoring. The LMP would require use of portable toilets for all campers not at developed campgrounds (restrooms are available at those locations) and additional pump-out facilities would be established at a minimum of 7 locations on Lake Mead and 3 locations on Lake Mohave. Locations of these facilities was not specified, but it is assumed they would be located in areas of high recreational use. Shoreline litter cleanup programs, elimination of glass and styrofoam containers, solid waste recycling and public education programs on littering and recycling are considered under the LMP.

Water quality monitoring for bacterial and chemical pollution is included in the LMP and would be expanded beyond existing levels. Gasoline and petroleum products from boats and personal watercraft operation and refueling have been found in high-use areas of the lakes. The NPS does not have the authority to create standards for gasoline-powered boats and watercraft; however, the LMP calls for the adoption of the scheduled 2006 Environmental Protection Agency standards for emissions in 2012. All personal watercraft and outboard engine-powered boats would be required to meet the standards after 2012 or would not be permitted to operate. Other sources of petroleum pollutants are boat maintenance activities and refueling. The LMP has a provision to provide guidance on best management practices to marina facilities operators and boater education to reduce these sources of pollution. Enforcement efforts are an important component in addressing these pollutants.

Another non-site specific action included in the LMP is an increased effort to require boater education and develop uniform boating laws. Arizona and Nevada share jurisdiction on the lakes and there are differing State requirements for boat operation. Accomplishment of this objective would require the involvement of the two States with the NPS.

Rainbow trout stocking by Nevada (consultation number 1-5-94-F-326) and the FWS (2-21-94-F-244) into Lake Mead and Lake Mohave is done under an existing consultation and is not a part of the proposed action. This activity is included in the environmental baseline.

Programmatic actions

The LMP contains actions that are not described in specific detail but for which consultation is requested. The programmatic portion of this consultation will be conducted under the protocol described in Appendix B. Some of these actions involve the cooperation of other Federal and

State agencies to accomplish. For bonytail chub and razorback sucker, these actions include placement of fish habitat enhancement structures for recreational fisheries enhancement, development of shoreline fishing facilities, and monitoring the effects of the proposed action on listed threatened and endangered species. The extent of present monitoring and the amount proposed under the proposed action are not defined. For southwestern willow flycatcher, these actions include clearing of non-native vegetation and replacement with native plant species. Proposed actions that may adversely affect the desert tortoise include expansion of existing recreational facilities and creation of new facilities as described in the DEIS. Approximately 5 acres of previously undisturbed tortoise habitat would be disturbed at the proposed Eldorado Landing site. Other expansions would take place in previously disturbed tortoise habitat.

Conservation measures

For razorback sucker and bonytail chub, the NPS has provided the following conservation measures in a memorandum to the FWS dated July 31, 2002 (NPS 2002b):

1. Surveys at the nine coves known to have spawning razorbacks on Lake Mohave and the two areas known from Lake Mead will continue. Surveys in Lake Mohave for bonytail chub will continue. The NPS cooperates in these surveys, but is not the prime funding source for the work.
2. Boat use of coves identified as native fish spawning areas during the spawning period will be monitored. If boat use increases dramatically or if the Native Fish Work Group recommends action, closures of the coves to boat use during the period will be implemented. Areas adjacent to razorback grow-out ponds on Lake Mohave will also be monitored. If vandalism to the ponds is documented, closures would be implemented.
3. Information about native fish in the lakes will be provided at marinas and with houseboat and other boat rentals. Information would encourage boaters not to use the spawning areas during the spawning season.
4. On Lake Mead, the back bay portions of Echo Bay will be closed to boat use during December 1-May 1 of each year to protect razorback sucker spawning locations. Information will be provided to boaters at the marina about the closures.
5. Las Vegas Bay Marina will remain a no-wake area to protect razorback sucker habitats in that area of Lake Mead.
6. For the expansion of Cottonwood Cove Marina on Lake Mohave, razorback surveys will begin this winter to assess any use of the expansion area. The site will also be added to the annual surveys during the breeding season.
7. All marinas will operate under the "Lake Mead National Recreation Area Best Management Practices, Watercraft and Marina Operations and Dry Boat Storage and Boat Repair Services"

or subsequent revised versions of the existing document. This document provides for management that reduces the risk of toxic spills into the lakes by fueling or other marina operations.

For the southwestern willow flycatcher, NPS has provided the following conservation measures included in the memorandum of July 31, 2002:

1. Surveys in known occupied habitats of the flycatcher by NPS, Bureau of Reclamation and contractors will continue. Surveys of potential habitats will be initiated by the NPS.
2. If breeding pairs are found, closures to restrict land and lake access by recreationists to the sites will be put in place.

NPS also proposes the following measures to minimize effects to desert tortoises from proposed projects:

1. A desert tortoise education program will be presented to all personnel onsite during construction and operation. This program will contain information concerning the biology and distribution of the desert tortoise, its legal status and occurrence in the proposed project area, the definition of "take" and associated penalties, measures designed to minimize the effects of construction activities, the means by which employees can facilitate this process, and reporting requirements to be implemented when tortoises are encountered.
2. All areas to be disturbed will have boundaries flagged before beginning the activity and all disturbance will be confined to the flagged areas. All project personnel will be instructed that their activities must be confined to locations within flagged areas. Disturbance beyond the actual construction zone is prohibited.
3. Before surface-disturbing activities, a qualified desert tortoise biologist will conduct a clearance survey to locate and remove tortoises using techniques providing full coverage of all areas. All desert tortoise burrows, and other species' burrows that may be used by tortoises, will be examined to determine occupancy of each burrow by desert tortoises. In accordance with *Procedures for Endangered Species Act Compliance for the Mojave Desert Tortoise* (USFWS 1992), a qualified desert tortoise biologist shall possess a bachelor's degree in biology, ecology, wildlife biology, herpetology, or closely related fields. The biologist must have demonstrated prior field experience using accepted resource agency techniques to survey for desert tortoises and tortoise sign. In addition, the biologist shall have the ability to recognize and accurately record survey results.
4. All burrows found within areas proposed for disturbance, whether occupied or vacant, will be excavated by a qualified biologist and collapsed or blocked to prevent desert tortoise re-entry. All burrows will be excavated with hand tools to allow removal of desert tortoises or desert tortoise eggs. All desert tortoise handling and excavations, including nests, will be conducted by a qualified desert tortoise biologist in accordance with Service-approved protocol (Desert Tortoise Council 1994, revised 1999).

5. All located desert tortoises and desert tortoise eggs will be relocated offsite 300 to 1,000 feet into adjacent undisturbed habitat. Tortoises found aboveground will be placed under a bush in the shade. A tortoise located in a burrow will be placed in an existing unoccupied burrow of the same size and orientation as the one from which it was taken. If a suitable natural burrow is unavailable or the occupancy status of the burrow is in question, a qualified biologist will construct one of the same size and orientation as the one from which it was removed using the protocol for burrow construction in Section B-5-f (Desert Tortoise Council 1994, revised 1999).
6. The onsite biologist will record each observation of desert tortoise handled. Information will include the following: Location, date and time of observation, whether tortoise was handled, general health and whether it voided its bladder, location tortoise was moved from and location moved to, and unique physical characteristics of each tortoise. Reports documenting effectiveness and compliance with the tortoise protection measures will be prepared every 6 months.
7. Project activities that may endanger a tortoise will cease if a tortoise is found on a project site. Project activities will resume after the biologist removes the tortoise from danger or after the tortoise has moved to a safe area. Stockpiled pipes that could attract tortoises will be capped or checked by a biological monitor before use.
8. During the tortoise active season (March 1 through October 31), all trenches and other excavations with side slopes steeper than 1-foot rise to 3-foot length shall be immediately backfilled prior to being left unattended, or: (1) Fenced with tortoise-proof fencing; (2) covered with tortoise-proof fencing; (3) covered with plywood or similar material; or (4) constructed with escape ramps at each end of the trench and every 1,000 feet, at a minimum. All coverings and fences shall have zero ground clearance. If alternative (4) is selected, the trench or other excavation will be inspected periodically and following periods of substantial rainfall to ensure structural integrity and that escape ramps are functional. An open trench or other excavation as described in Term and Condition 2.a. above shall be inspected for entrapped animals immediately prior to backfilling. If at any time a tortoise is discovered within a trench, all activity associated with that trench shall cease until a qualified biologist has removed the tortoise in accordance with Service-approved guidelines (Desert Tortoise Council 1994, revised 1999).
9. Trash and food items will be disposed of properly in predator-proof containers with re-sealing lids. Trash containers will be emptied daily and waste will be removed from the project area and disposed of in an approved off-Reservation landfill. Trash removal will reduce the attractiveness of the area to opportunistic predators such as desert kit fox, coyotes, and common ravens. Construction waste will be removed from the site daily and disposed of properly at an approved off-Reservation landfill.

10. Prior to surface disturbance activities within desert tortoise habitat, NPS or the project proponent shall pay a remuneration fee of **\$623 per acre** of proposed disturbance into the Desert Tortoise Public Lands Conservation Fund Number 730-9999-2315 (section 7 account). This fund is administered by Clark County, and used for securing and enhancing tortoise habitat and tortoise research. The administrator serves as the banker of these funds and receives no benefit from administering these funds. These funds are independent of any other fees collected by Clark County for desert tortoise conservation planning. None of these funds shall be used to develop a habitat conservation plan. The payment shall be accompanied by the attached **Section 7 Fee Payment Form** (Appendix C), and completed by the payee. The project proponent or applicant may receive credit for payment of such fees and deduct such costs from desert tortoise impact fees charged by local government entities. Payment shall be by certified check or money order payable to Clark County (or other administrator named by the Bureau and Service), and delivered to:

Clark County
 Department of Comprehensive Planning
 500 South Grand Central Parkway, Third Floor
 Las Vegas, Nevada 89155-1712

If fees are paid after March 1, 2003, the rate will be indexed for inflation based on the Bureau of Labor Statistics Consumer Price Index for All Urban Consumers (CPI-U). Information on the CPI-U can be found on the internet at:
<http://stats.bls.gov/news.release/cpi.nr0.htm>.

11. To minimize and monitor the effects to desert tortoises along high traffic roads within the LMNRA, NPS shall record observations of desert tortoises and desert tortoise mortalities. If tortoises appear to be impacted by road at a specific location, the NPS shall implement appropriate measures to minimize these effects in coordination with the Service, which may include reduced speed limits, installation of warning signs, and/or installation of tortoise-proof fencing.

STATUS OF THE SPECIES (RANGE-WIDE)

Species/critical habitat description

Southwestern willow flycatcher

The southwestern willow flycatcher was listed as an endangered species, without critical habitat, on February 27, 1995 with an effective date of March 29, 1995. Critical habitat was designated on June 22, 1997 and set aside on May 11, 2001 by court order. No critical habitat units were designated in the action area for this consultation. The draft recovery plan was recently provided for public review (USFWS 2001a).

Bonytail chub

The bonytail chub was listed as an endangered species on April 24, 1980, with an effective date of May 23, 1980. Critical habitat was designated in six river reaches within the historic range of the bonytail on March 21, 1994 with an effective date of April 20, 1994. Critical habitat in the action area includes Lake Mohave up to its full-pool elevation. All critical habitat areas were considered occupied at the time of designation. Constituent elements of critical habitat include water, physical habitat and biological environment. The Bonytail Chub Recovery Plan was most recently updated in 1990 (USFWS 1990).

Razorback sucker

The razorback sucker was listed as an endangered species on October 23, 1991, with an effective date of November 22, 1991. Critical habitat was designated in 15 river reaches within the historic habitat of the razorback on March 21, 1994 with an effective date of April 22, 1994. Critical habitat in the action area includes Lake Mead and Lake Mohave up to their full-pool elevations. All critical habitat areas were considered occupied as the time of designation. Constituent elements of critical habitat include water, physical habitat and biological environment. The Razorback Sucker Recovery Plan was signed in 1998 (USFWS 1998).

Desert tortoise

An emergency listing as endangered for desert tortoises found north and west of the Colorado River in California, Nevada and Utah was published on August 4, 1989. The entire Mohave population of the desert tortoise (including populations north of the Colorado River in Arizona not designated in 1989) was listed as a threatened species on April 2, 1990, with an effective date of April 2, 1990. Critical habitat in Arizona, California, Nevada and Utah was designated on February 8, 1994 with an effective date of March 10, 1994. Constituent elements of critical habitat included physical habitat and biological environment. The Desert Tortoise (Mohave Population) Recovery Plan was signed in 1994 (USFWS 1994).

Life history*Southwestern willow flycatcher*

Life history information on the flycatcher can be obtained from the draft Recovery Plan (USFWS 2001a). Information on surveys and monitoring in the lower Colorado River vicinity are available in the annual reports by San Bernardino County Museum to the Bureau of Reclamation (Reclamation). The most recent report available is for the 2001 field season (McKernan and Braden 2002).

Bonytail chub

Life history information on the bonytail can be obtained in the 1990 Recovery Plan (USFWS 1990), and in background materials presented in the draft recovery goals documents (SWCA 2001a).

Razorback sucker

Life history information on the razorback can be obtained in the 1998 Recovery Plan (USFWS 1998), and in background materials presented in the draft recovery goals documents (SWCA 2001b).

Desert tortoise

Life history information on the desert tortoise can be obtained in the 1994 Recovery Plan (USFWS 1994).

Species status and distribution*Southwestern willow flycatcher*

Complete range-wide status and distribution information can be obtained in the draft Recovery Plan (USFWS 2001a). The following is a brief summary.

The current estimate for the range-wide flycatcher population is between 1,100 and 1,200 pairs/territories. Intensive monitoring and survey efforts since the species was listed has significantly increased the known numbers of pairs/territories beyond that known at the time of listing. There has also been a continuing degradation and loss of occupied habitat due to various actions (Federal and non-Federal) since listing. Under previous section 7 consultations, occupied habitats have been protected to offset habitat losses elsewhere due to project effects from Federal actions. Although this provides some stability for the newly protected habitats, a net loss of birds and habitat may still result on a range-wide level. Where unprotected habitats are not available for conservation, restoration and replacement of habitat may be used under section 7 consultation to minimize the effects of proposed Federal actions on the flycatcher. Most past efforts to restore cottonwood-willow habitats were not designed to provide flycatcher habitat and have not been successful for this purpose. Recent riparian restoration efforts have focused on providing for flycatchers; however, most stands are yet too young to provide suitable nesting sites. Success with habitat restoration is critical for conservation purposes since the amount of suitable or potential unprotected habitat is very limited.

Bonytail chub

Range-wide status and distribution information can be obtained in the background sections of the draft recovery goals documents (SWCA 2001a) and in the Service's recent (April 30, 2002) biological opinion on Reclamation's operations and maintenance of the lower Colorado River (consultation number 2-21-95-F-216R; USFWS 2002).

The range-wide trend for the bonytail is the continued decrease in wild populations due to lack of sufficient recruitment of wild-born and reared young adults to offset the loss of old adults due to

natural mortality. The remaining wild populations are extremely small and complete loss of the remaining wild-born individuals is expected to occur within the decade. Extinction of this fish in the wild throughout its historical range is being forestalled by the stocking of captive-born sub-adult fish into rivers in the Upper Colorado River Basin and in Lake Mohave and Lake Havasu in the Lower Colorado River Basin. Fish for these efforts are produced at Dexter National Fish Hatchery and Technology Center (Dexter) and are grown to stocking size at Dexter, Willow Beach National Fish Hatchery on Lake Mohave, the Achii Hanyo Fish Rearing Facility on the Colorado River below Lake Havasu, and at other Federal, State and private facilities. These stockings are intended to create populations of young adults that may be expected to persist for 40-50 years. While it is expected that these young adults will reproduce in the wild, the successful recruitment of wild-born fish to the population may not occur without additional management of habitat and biological factors. Management and research on these populations will be critical to provide for the survival and recovery of the species. Of vital importance to the stocking program is the maintenance and enhancement of the existing bonytail broodstock held at Dexter. Genetic evaluation of the existing F1 broodstock is underway to assist and formulating a new broodstock (the F1 fish are over 20 years old and replacements for the broodstock are needed). Infusion of additional, unrelated wild-born individuals is being actively pursued in order to maximize the amount of genetic variability in the new broodstock. Captive born individuals from the original F1 and F2 breedings that have survived in the wild may also be incorporated.

Designated critical habitat in the species range is occupied by bonytail populations. No critical habitat areas are considered pristine or unmodified. Changes to water flows and physical habitat conditions from the pre-development patterns have had significant impacts to habitat quality; however, the areas remain capable of supporting the species at some level. The biological environment has also changed significantly with the introduction of non-native fish species. The non-native fish may be the greatest impediment to survival and recovery of the bonytail.

Razorback sucker

Range-wide status and distribution information can be obtained in the background sections of the draft recovery goals documents (SWCA 2001b) and in the Service's recent (April 30, 2002) biological opinion on Reclamation's operations and maintenance of the lower Colorado River (consultation number 2-21-95-F-216R; USFWS 2002).

The range-wide trend for the razorback is the continued decrease in wild populations due to lack of sufficient recruitment of wild-born and reared young adults to offset the loss of old adults due to natural mortality. The remaining wild populations are extremely small and the loss of all but one of remaining wild populations is expected to occur within the decade. The exception to this is the Lake Mead razorback population, which is made up of young to middle-aged fish forming a second post-impoundment generation. Extinction of this fish in the wild elsewhere in its historical range is being forestalled by the stocking of captive-born sub-adult fish into rivers in the Upper Colorado River Basin and in Lake Mohave, Lake Havasu and the Colorado below

Parker Dam in the Lower Colorado River Basin. These stockings are intended to create populations of young adults that may be expected to persist for 40-50 years. While it is expected that these young adults will reproduce in the wild, the successful recruitment of wild-born fish to the population may not occur without additional management of habitat and biological factors. Management and research on these populations will be critical to provide for the survival and recovery of the species. The ongoing Lake Mohave population replacement program sponsored by the Native Fish Work Group is providing a genetically variable "broodstock" for the razorback in the form of young wild-born fish captured, reared and then repatriated to the lake. Adult fish from this population will be used to provide young fish for stocking elsewhere in the historical range.

Designated critical habitat in the species range is occupied by razorback populations. No critical habitat areas are considered pristine or unmodified. Changes to water flows and physical habitat conditions from the pre-development patterns have had significant impacts to habitat quality; however, the areas remain capable of supporting the species at some level. The biological environment has also changed significantly with the introduction of non-native fish species. The non-native fish may be the greatest impediment to survival and recovery of the razorback.

Desert tortoise

The range-wide population trend for the tortoise continues to decline. This determination is based on the observation of tortoise carcasses and fewer live tortoises and sign during inventory and monitoring transects.

Analysis of the species/critical habitat likely to be affected

The proposed action would take place in occupied habitats for the flycatcher, bonytail, razorback and tortoise, within designated critical habitat for the two fish species and adjacent to tortoise critical habitat.

The lower Colorado River is an important recovery area for the flycatcher (USFWS 2001a). Information developed from 2001 data (McKernan and Braden 2002) indicates that the overall lower Colorado River survey area is a source, and not a sink population, and thus provides birds for the local and regional populations.

The largest remaining populations of bonytail in the wild are in Lake Mohave and in Lake Havasu, the next reservoir downstream, and are important for species survival and recovery. Both populations are the result of stocking young fish born from the existing broodstock into the declining wild populations. The physical habitat and biological environment constituent elements of critical habitat may be affected by the proposed action.

Lake Mead supports the only documented naturally recruiting population of razorback within the range. Lake Mohave will support the future broodstock for the razorback that will be used range-wide for recovery operations. Other razorback populations established in Lake Havasu and

the river below Parker Dam will contribute to research for habitat and species management as well as contributing to the total population in the lower Colorado River maintained for recovery purposes. The physical habitat and biological environment constituent elements of critical habitat may be affected by the proposed action.

Desert tortoise populations around the perimeter of the two lakes would be affected by the continued operation and expansion of shoreline developments and dispersed recreational access afforded by shoreline zoning. Use of existing roads to access the lake shore continues the existing threat of mortality or removal by illegal collecting.

ENVIRONMENTAL BASELINE

The environmental baseline includes past and present impacts of all Federal, State, or private actions in the action area, the anticipated impacts of all proposed Federal actions in the action area that have undergone formal or early section 7 consultation, and the impact of State and private actions which are contemporaneous with the consultation process. The environmental baseline defines the current status of the species and its habitat in the action area to provide a platform to assess the effects of the action now under consultation.

The 1997 and 2002 formal consultations with Reclamation on their operations and maintenance of the lower Colorado River (which includes the action area), and the 2001 consultation on the Interim Surplus Criteria for Lake Mead (also with Reclamation) provided extensive discussions of the environmental baseline (as it relates to the aquatic and riparian areas) for the NRA and vicinity. The information in those documents (USFWS 1997, 2001b and 2002), and the 1996 Reclamation biological assessment for the 1997 consultation (USBR 1996) and 2001 consultation (USBR 2000) are incorporated herein by reference.

Lake Mead was formed by the construction of Hoover Dam in the 1930's and Lake Mohave was formed by construction of Davis Dam in the 1950's. Water stored in Lake Mead and Lake Mohave is managed by Reclamation in accordance with the Law of the River and flood control requirements. Inflows to Lake Mead are the sum of Glen Canyon Dam releases (which are under Federal control), inflows from tributaries in the Grand Canyon, and the Virgin/Muddy River inflows. Lake Mead water levels are managed in conjunction with Lake Powell water levels. Water is released from Lake Mead to meet downstream water orders for Federal, Tribal and State water users and the releases are also planned to generate hydropower under existing contracts. Released water passes through Lake Mohave, which acts as a regulating reservoir for the Hoover Dam releases, and additional power is generated at Davis Dam at the lower end of the NRA. Existing flood control requirements and water and power contracts will continue to affect water releases from Lake Mead and Lake Mohave, which affects the water surface elevations of the lakes. The NPS has no authority over water management operations on either Lake Mead or Lake Mohave.

Water quality issues that involve urban pollutants reaching Lake Mead from the Las Vegas area via Las Vegas Wash are an ongoing issue. Several studies have been initiated to define the types of pollutants and the effects to fish and wildlife resources in Lake Mead. A number of private,

State and Federal agencies are examining the problem and attempting to define options to address the situation. Work in this arena is in the early stages, and will be continuing for several years. The NPS does not have any control over the inflows to Lake Mead from Las Vegas Wash.

The NRA was established to provide public recreational opportunities, especially for water-based recreation. Thousands of people visit the lakes every year for swimming, fishing, all forms of boating, and other recreational activities. A number of recreational sites and facilities are in place to provide for this use. These are described in the NPS DEIS (NPS 2002) that acts as the biological assessment/evaluation for this consultation.

A. Status of the species within the action area

Southwestern willow flycatcher

Because much of the Lake Mead and Lake Mohave shorelines lack suitable amounts of riparian vegetation with the proper structural and hydrological characteristics needed by the flycatcher, suitable habitat is limited to inflow areas of the Colorado River and other tributaries and major washes. Migrating or dispersing flycatchers may use areas not suitable for nesting during spring and fall.

The most recent published report (McKernan and Braden 2002) is for the 2001 field season. Flycatcher surveys at the Virgin River-Lake Mead delta in 2001 found flycatchers at one of the 5 survey sites. The 4 sites without flycatchers supported birds during 1997-1999. Some of the black willow habitat in this area is dead, possibly the result of declining water levels in Lake Mead. Since 1997, flycatchers have been observed breeding along the lower Muddy River on Overton State Wildlife Management Area. Nesting habitat has been documented upstream of the NRA on the Virgin River near the confluence with Lake Mead. The flycatcher habitat formed at the Colorado River-Lake Mead delta in the early 1990's no longer exists due inundation and subsequent drowning of the riparian habitat during the mid-1990's. This habitat may return in response to lowering lake levels, but will always be transitory. There is occupied flycatcher habitat in the lower Grand Canyon (Christensen 2001), but this is outside of the NRA boundaries in Grand Canyon National Park and the Hualapai Indian Reservation. Since 1998, flycatcher surveys have been conducted in Las Vegas Wash. Results of these surveys have detected flycatchers in most years, but breeding activity has not yet been observed (SWCA 1998, 1999, 2000). These areas are located above the portion of Las Vegas Wash adjacent to Lake Mead, but do provide information supporting at least migratory use of the general area.

On Lake Mohave, limited surveys done by Reclamation have documented flycatchers using some shoreline riparian habitats, especially in the Waterwheel and Rockefeller coves and adjacent areas. These habitats are limited in size and scope and are apparently only used by migrating or dispersing birds as nesting has not been confirmed.

Bonytail chub

The bonytail is no longer found in Lake Mead. Populations were documented after the closure of Hoover Dam (Moffett 1943, Wallis 1951) but no fish have been found in the lake since the

1950's. The population in Lake Mohave was documented in the area prior to and after closure of Davis Dam and individuals have been captured through to 2002 (summarized in Minckley and Thorson 2002). Stocking of bonytail into Lake Mohave began in 1980 with 174,000 fingerlings and 28,000 larval bonytail stocked between 1980 and 1996 (USFWS 1997). An unknown number of these fingerlings did survive to become adults in the lake. A total of 26,826 sub-adult bonytail (Service data) were stocked into Lake Mohave between 1997 and the end of 2001 in accordance with an intra-Service biological opinion on the stocking of rainbow trout into the lake (USFWS 1994b). This number is well below the 125,000 fish that were to be stocked by 1999 under the opinion, and the effort is continuing until the target is met. Problems with rearing the young bonytail to the appropriate size for stocking is a major cause of the reduced stocking effort to date. Efforts are underway by the Service and Reclamation to refine rearing techniques and develop additional rearing facilities to increase production. Survival of the sub-adult fish in the lake has been documented, but recaptures have been too few to determine the rate of survival of the stocked sub-adults. Recent (2001-2002) efforts to capture wild or captive-born adults from Lake Mohave to add to the broodstock have resulted in one adult bonytail being taken from Lake Mohave in 2002. This fish was captured south of Cottonwood Cove (Chuck Minckley, pers.com). Three sub-adult bonytail were captured in 2001 at Arrowhead Cove, 2.5 miles north of Katherine Landing (Minckley and Thorson 2002). Capture records for bonytail from Lake Mohave over the last 5 years have been from the vicinity of Arrowhead Cove. The vicinity of Cottonwood East Cove (across the lake from Cottonwood Cove) was a known capture location for bonytails up until the mid-1990's (Minckley and Thorson 2002).

Razorback sucker

Recent estimates of the Lake Mead razorback population indicates 75-90 individuals for each of the two populations. Only wild-born and stocked fish alive more than one year were used to generate these figures (Holden et al. 2001). The original Lake Mead population was significantly larger (no estimates were made in the 1940's through 1970's) than the current population. The original population, born in the late 1930's and early 1940's, began to decline in the 1970's due to fish dying of old age. Based on the results of aging captured razorbacks (Holden et al. 2001), limited but successful recruitment of young fish to the population occurred in the 1980's and 1990's. These second or third generation fish form the current population. The physical factors that enabled these events are not known with certainty, but studies are ongoing. A very limited number of young of the year larvae are captured and reared in off-lake habitats, returned to augment the naturally recruited population. Repatriated individuals have been captured on the spawning grounds at Las Vegas Wash and Echo Bay along with the wild fish. These captive reared fish are also being used to assist in locating other spawning groups, particularly in the upper portion of the lake near Pearce Ferry. Since the captive reared fish are found with the wild fish elsewhere in the lake, it is hoped that the radio/sonic tagged repatriates will locate any wild spawning population in the upper lake. Razorback larvae have been found in the Grand Wash Cliffs area, but not the spawning adults.

Research on the Lake Mead razorback population began in 1996 and continues to the present day. Annual reports (Holden et al. 1999, 2000a, 2000b, 2001) contain information on capture locations, seasonal movements, spawning locations, larval capture, and estimates on the size and age of the population. The following material is summarized from those reports.

The two known spawning areas for the razorback in Lake Mead are both in immediate proximity to a developed marina; Blackbird Point is across the channel from Las Vegas Marina, and the Echo Bay site is upstream of Echo Bay Marina within the Bay. Telemetry studies show that adult razorback suckers use the spawning areas intensively during the November to April spawning period and may also be found in the area during the non-spawning period, along with the western shores of the Overton Arm and the north shore of Las Vegas Bay. Use of areas is consistent from year to year, but is influenced by water level elevations of the lake. At the lower elevations seen beginning in 2000, use of the lower reach of Las Vegas Wash and the upper end of Echo Bay was not possible since the areas were dry. Individuals from the two known concentrations do not move between the two areas, resulting in significant isolation of the groups.

By January 2002, 55,667 sub-adult razorbacks had been stocked into Lake Mohave as part of the Native Fish Work Group and Service effort to replace the senescent population with captive-reared but wild-born sub-adults. This effort will continue until the estimated population of young fish equals the target population of 50,000 individuals. The repatriates are found in the company of the adults on the spawning areas of Lake Mohave during the spring and are reaching the age and size to become spawners themselves. The main spawning areas in Lake Mohave are in coves in the central part of the lake (the Cottonwood Basin) although some are also found in the riverine section near Willow Beach. The Cottonwood Basin spawning sites are in the general vicinity of Cottonwood Cove Marina, but are not adjacent to the site. Isolated rearing coves have been established at several sites on Lake Mohave to allow young fish to grow up in a more natural environment than a hatchery. These coves include Yuma Cove near Cottonwood Cove and Davis Cove near Katherine Landing.

Desert tortoise

Desert tortoises have a patchy distribution on the NRA. Most of the NRA supports low densities of tortoises, although some areas of higher densities have been recorded. Areas near the lakeshore are generally located in marginal habitats with low tortoise numbers. Access roads, particularly the road to Overton Beach, cross areas of higher quality habitat and higher tortoise numbers. There is no specific information on the numbers of tortoises on the NRA; however, the range-wide trend of declining populations is applicable to the NRA.

Factors affecting species environment within the action area

Southwestern willow flycatcher

Natural riparian habitats in the floodplain of the Colorado River where Lake Mead and Lake Mohave now exist were eliminated by the construction of Hoover Dam and Davis Dam and the formation of the large lakes behind them. Water management operations on both lakes are not conducive to the development of significant cottonwood-willow riparian zones, and what areas have some suitability to develop riparian habitats often become infested with invasive salt cedar

that crowds out the native tree species. These shoreline or delta riparian areas are formed or destroyed through the changing water levels, especially on Lake Mead where seasonal and yearly water level fluctuations are more severe than on Lake Mohave.

Development of recreational facilities on the shorelines and providing access to recreationists over most of both lakes also has had an influence on shoreline riparian habitats. Coves and wash mouths with trees are more desirable to campers arriving by land or water, and human disturbances during sensitive periods may reduce the use of the area by flycatchers. Human use also increases the risk of accidental fire in riparian areas that may destroy habitat.

Bonytail chub, razorback sucker and designated critical habitat

Construction of Hoover and Davis dams created the two reservoirs that make up the NRA and eliminated the historic riverine habitats. There is a reach of river habitat below Hoover Dam, but because of managed flows and cold water releases, the hydrology is significantly different from that found in the pre-dam era. The reservoir habitats do provide suitable habitat for the bonytail and razorbacks, and that was a factor in their designation as critical habitat for these species.

Reservoir operations and the changes to water levels have direct effects on spawning and nursery areas through inundation and exposure. The presence and quality of vegetative cover is also influenced by water level. Lower water levels allow for development of terrestrial vegetation that provides cover at higher water levels. Fluctuating water levels inhibit submerged aquatic and emergent vegetation from forming. Fish forage items in the form of aquatic invertebrates that use submerged or emergent vegetation are rarer in these circumstances, but other benthic invertebrates are available. Reservoirs also have different nutrient cycles and phytoplankton and zooplankton cycles from the historical river conditions that affects food resources for all life stages of fish. Bonytail and razorback can utilize the existing food resources successfully.

The presence of non-native fish in the lakes has been identified as the most significant factor in the lack of natural recruitment by bonytail and razorback. Spawning by both species has been documented in Lake Mohave beginning in the 1950's and in Lake Mead for razorbacks and bonytails in the 1930's. The early populations of bonytail and razorback grew very quickly because of the successful recruitment in years before large numbers of non-native fish were present. The lack of recruitment in Lake Mohave after the 1950's resulted in the senescent populations of bonytails and razorbacks that now dying off and being replaced by young fish raised for release back into the lake. The same scenario was observed in Lake Mead in the 1930's, with the bonytail largely vanished by the late 1950's and the razorback population dying out by the 1980's. The existing second generation of wild born and recruited razorbacks in Lake Mead are a unique and important population unlike any other remaining razorback population within the range of the species.

Pollutants, in the form of petroleum products or urban runoff/effluent, may have effects to habitat quality in shallow areas where recreational use is high or developed facilities exist near known feeding, spawning or nursery areas. The size of Lake Mead and the flow-through character of

Lake Mohave do not provide conditions that would result in high lake-wide levels of these pollutants. Naturally occurring selenium is also present in the system, but not at significantly high levels. Recent data from environmental contaminant sampling in Las Vegas Bay indicates that endocrine dysfunction in carp (*Cyprinus carpio*) is occurring and may result from residues of personal care products or other contaminants that are entering Lake Mead from Las Vegas Wash. Razorbacks are also been tested for this dysfunction as part of ongoing studies. Additional information is being developed to define any problems. Effluent inflows from any source around the shorelines of Lake Mead or Lake Mohave may contain these residues as well as other contaminants.

Desert tortoise

Desert tortoises occur in upland and desert wash habitat on NRA. Development of recreational facilities and recreational use of the area have removed or degraded desert tortoise habitat in the affected area. Numerous park and access roads inundate the NRA which result in habitat fragmentation in addition to desert tortoise mortality from vehicle encounters. Wild burros have caused extensive damage to desert tortoise habitat. Recreationists likely harass, harm (by picking them up and causing them to void their bladder), and collect desert tortoises for pets in violation of State and Federal laws. Infrastructure that traverses desert tortoise habitat may facilitate predation of desert tortoises by making them more visible to predators. Roads also promote the spreading of undesirable weedy plants through an area that affects food availability. Tortoises may also be harmed by ingesting trash or entangling themselves with various materials left or discarded by visitors. Disease is also a factor in declining tortoise populations.

EFFECTS OF THE ACTION

Effects of the action refer to the direct and indirect effects of the proposed action in the species or critical habitat, together with the effects of other activities that are interrelated and interdependent with that action, that will be added to the environmental baseline. Interrelated actions are those that are part of a larger action and depend on the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration. Indirect effects are those that are caused by the proposed action and are later in time, but still are reasonably certain to occur.

Direct and indirect effects

The proposed action is Alternative C in the new LMP for the NRA, changes made in the July 31, 2002 memorandum, and the conservation measures listed in this opinion. This action will provide a certain level of recreational facilities and recreational use levels including shoreline zoning for Lake Mead and Lake Mohave. The proposed action contains provisions for existing recreational facilities to continue to operate and for the expansion of some existing facilities and construction of new ones. Existing access roads to these facilities and the lake shore in general are also included in the proposed action.

Recreational opportunity zoning for the NRA in the Urban Natural and Urban Park categories comprises 51% of Lake Mead and 84% of Lake Mohave. These zones contain most of the recreational use allowed for in the proposed action. Effects to threatened and endangered species or designated critical habitat are greatest in these zones. Where recreational activity is high enough to require additional shoreline zoning to designate different activity areas, habitat for species may be significantly disturbed or eliminated.

Within the zones, a component of activities in the LMP involves access facilities (boat ramps, parking lots, marinas) for recreational use within the various shoreline zones. New construction, either at existing or totally new facilities, has effects to shorelines and adjacent uplands as well as in-lake habitats. Clearing sites for ramps, parking lots and other buildings increases dust and may introduce sediments into the lake at the construction site. For properly designed sites, these effects do not last long after completion of construction. Placement of launch ramps sufficiently far into the lake to allow for use at lower water levels converts natural substrates to artificial ones (concrete, metal mesh or other materials) which locally reduces habitat for submerged plants and invertebrates. Fish spawning habitat at these sites is also lost. Shoreline vegetation, either riparian (along the shore or in the lower portions of desert washes near the shore) or emergent, may also be eliminated to provide space for the facilities. Upland and desert wash habitats used by tortoises may be destroyed by construction. Developed camping areas generally do not extend below the high water line, and do not directly alter shorelines, however, there is a loss of upland vegetation. Recreational use of the area may result in loss of vegetation from the shoreline or in desert washes due to human use effects (wildfire, illegal wood cutting/gathering, trampling) as well as harassment of resident wildlife, including tortoises. Roads are also away from the shoreline, but drainage off the roads may cause localized erosion that increases sediment inflow to the lake. Roads are also a threat to tortoises through direct mortality and indirectly through providing opportunities for illegal collection of tortoises as well as promoting the spread of noxious weeds that reduce foraging opportunities.

Operation of boat launch and marina facilities also have effects to fish and wildlife habitats in the vicinity of the facility. Noise from operations and nighttime lighting affect local conditions. Human activity is high and easily disturbed wildlife, such as flycatchers or tortoises, that may abandon remaining suitable habitats adjacent to the facility. Fish are also affected by noise from boat engines and other mechanical devices and may abandon an area. This is not always the case since fish, especially carp, are abundant around launch areas and marinas. This may be a response to additional cover provided by docks, enhanced food resources from recreationists feeding the fish, or other factors. Water quality around boat launch or marina facilities may be an issue for fish health.

Petroleum products and other potential pollutants are introduced to the lakes in a variety of locations including runoff from roads. Day to day operations likely input low levels of these materials to the lakes over a long period of time that allows for dispersal and dilution within the water. At marinas, there is the potential for spills from gas docks and boat maintenance operations that may input significant amounts of pollutants to a small area in a small time. These types of incidents may cause injury or death to fish in the vicinity of the facility.

Rural Natural zoning also provides for extensive recreational uses of the lake. In Lake Mead, approximately 47% of the lake is in this category. Several recreation facilities (Bonelli Landing, Greggs Hideout, South Cove, and Pierce Ferry) are in this zone. In Lake Mohave, 14% of the lake is permanently in this category, including the proposed recreation site at Eldorado Canyon. The reach from Willow Beach to Hoover Dam, an additional 2% of the lake, is seasonally Rural Natural/Semi-Primitive/Primitive. Some types of boating or water activities may be restricted, but these restrictions are limited in area and scope. Most known endangered species habitats are not within the Rural Natural Zone, but there remains the potential for disturbance to shallow water habitats, especially from boat wakes.

The Semi-primitive and Primitive zones make up the remainder of the lakes. Within these areas are motorized watercraft restrictions that reduce the amount of disturbance to the areas. Access is still allowed, but the amount and type of recreational use is limited by the restrictions. Boat wakes are generally not an issue in these areas.

Lakes Mead and Mohave: potential effects to southwestern willow flycatcher

Flycatchers are migratory birds that move into the lower Colorado River region in April and May, departing in September. This is also the high visitor-use period on the NRA. Nesting habitat for the flycatcher has not been documented on either Lake Mead or Lake Mohave. Nesting habitats exist outside the boundaries of the NRA, and access to these areas is possible through the NRA. This is of special concern in the Muddy and Virgin river inflow areas, where occupied nesting habitat is known to occur inside and outside of the NRA boundaries. The actual amount of suitable habitat within the NRA is unknown and changes over time in response to changes in lake elevation. The Virgin River inflow is designated as Semi-primitive, where boats up to are allowed to operate at wakeless speeds but personal watercraft are not allowed. Access by non-motorized boats would also be allowed, so some degree of human presence would continue to occur. The amount of use is not known, but is limited due to the remoteness of the area and lack of significant other access potential. The Muddy River inflow would not have motorized boat restrictions under the proposed Urban Natural recreational zoning and the expanded Overton Beach facilities are in proximity to that inflow area. The degree of use for the larger area accounts for 988 BAOT units of the total 3,295 for Lake Mead, equal to 29% of the total. The number of recreationists that would go up beyond the lake to the Muddy River area is not likely to be large since there are no destinations at the confluence. Boat access from the lake to the area containing the flycatcher habitat is very limited and recreational access from the lake is not likely to pose a significant threat to this habitat. If problems with recreationist access to flycatcher habitats is identified, closures would be put in place during the breeding season.

Effects to existing migratory habitat in Las Vegas Wash from the proposed action is not anticipated. Access to the lowest reaches of the Wash near the lake are conditional on lake elevation and sediment conditions and access is likely to remain limited with little potential for adverse effects.

Habitat suitable for flycatcher resting and foraging is located at some shoreline areas around the lakes. Use of these riparian habitats has been documented on Lake Mohave; no such surveys have taken place on Lake Mead. Areas with sufficient stands of trees to attract flycatchers are also the types of areas attractive to recreationists coming in by boat to shorelines for camping. Human activities in the area may affect use by birds, and there is an increased risk of fire in the salt-cedar dominated riparian woodlands that represent flycatcher habitat in these areas. Since suppression of these types of fires is not likely to occur, habitat could be lost over the life of the project. If problems with recreationist access to flycatcher habitats is identified, closures would be put in place during the breeding season.

Lake Mead: potential effects to razorback suckers

Recreational zoning in the known areas of razorback spawning habitat are in the Urban Park zones of Lake Mead. Both of the Lake Mead razorback spawning groups use habitat in the immediate vicinity of existing marinas (Las Vegas Bay Marina and Echo Bay Marina). The level of existing recreational use and marina operations at these sites has not had any documented effects to the razorback sucker populations; however, monitoring for such effects has not been in place. The intensive monitoring done by BioWest (Holden et al. 2001 and earlier reports) has shown razorback use of the areas consistent over several years. Since spawning, and the highest concentration of use by individual razorbacks is during the lower visitor use periods, the amount of boat noise is less as is the amount of overall human disturbance during these critical periods. During the summer months, the razorbacks are more dispersed along the shorelines away from the marinas and are still in areas of high visitor use in the larger Las Vegas Bay area and Overton Arm.

The proposed action provides for existing operations at the Las Vegas Bay Marina with no increase in those facilities. Shoreline zoning and associated recreational uses would not change from present uses or level of use. The Echo Bay Marina's existing facilities would be increased by 202 double (pull-through) parking spaces and 180 marina slips (see Table 2) under the proposed action. Overton Beach would gain 100 single parking spaces, 50 in-water marina slips and 80 dry boat storage spaces (Table 2). The Overton Arm would also gain a new recreation site at Stewarts Point with a 4 lane public launch ramp and 150 double parking spaces. These new or expanded facilities would enable increased use of the Overton Arm for recreation. The Stewart Point and Overton Beach sites are upstream from razorback telemetry records except those from the Muddy River inflow to the Overton Arm. Effects to razorbacks from the Stewarts Point and Overton Beach facilities would likely be related to the overall increase in recreational use within the Overton Arm. This is based on the lack of known razorback use of the immediate area of these 2 facilities. Effects to razorbacks are likely to be in the form of harassment from boat noise, fuel and other pollution events, and reduction in undisturbed shoreline habitats. Las Vegas Bay Marina already has a "no wake" zone in place that protects the razorback habitat toward Las Vegas Wash, so effects from significant amounts of motorized boat traffic is already minimized. The razorback habitat at Echo Bay would be closed to boat access during the spawning period, which would reduce the potential for effects to this area.

The amount of petroleum products and other pollutants introduced into Lake Mead from operations of marinas and illegal fueling actions outside of approved areas is unknown. Efforts by the Park Service to restrict illegal actions through enforcement and education is part of the proposed action, as are guidelines for marina operators providing for best management practices to reduce the potential for toxic materials to enter the lake. Expansion of the number of boats using the lake and its facilities under the proposed action may increase the risk of a major spill or the amount of material accidentally or incidentally introduced to the lake. The existing degree of risk is not known, and the increased risk cannot be quantified. Once the new restrictions on motorcraft engines come on line in 2012, the amount of waste fuels in the water from boats and personal watercraft will decline, reducing any water quality effects to the fish. Use of best management practices will help reduce the risk of contaminants entering the water.

Shoreline zoning for most of the various recreational uses in the Boulder Beach Shoreline Area is not likely to have significant effects on the razorback populations. The exception is for the development of new shoreline fishing access points or placement of fish enhancement structures. Specific locations for these types of actions were not identified in the DEIS, but existing sites are located in the Boulder Beach area south of the razorback habitats in Las Vegas Bay. Activities that concentrate predacious fish species near razorback spawning and nursery habitats may affect the potential for future recruitment events. Marinas, in part because of visitors feeding fish from the docks, are also apparent concentrators for species such as carp (*Cyprinus carpio*) that are known to eat razorback eggs. The necessary distance between spawning and nursery habitats and such concentrations of carp and other fish species needed to eliminate any effect to recruitment is unknown. Given the numbers of carp and other predacious fish in Lake Mead, the actual effect of creating localized concentrations is not known. In the absence of this knowledge, placing additional fish attractors near razorback spawning and nursery areas in Las Vegas Bay and Echo Bay should be discouraged in future planning for these activities. Because these are programmatic projects, additional consultation will be needed at the time of implementation.

Lake Mohave: potential effects to razorback sucker

Recreational zoning in the known areas of razorback spawning habitat are in the Urban Park and Urban Natural zones of Lake Mohave. Most of the known spawning sites are in the northern part of the Cottonwood Basin north through the Arizona Bay and Owl Head Cove areas. The only developed recreation area is at Cottonwood Cove Marina. Dispersed camping (primarily boat and houseboat based) occurs throughout the spawning area. However, since razorback spawning is during periods of low recreational use, the effects from site disturbances and boat noise are limited. Because there is recreational access to the isolated razorback grow-out coves in this area, there is a risk of recreationists intentionally introducing non-native fish species to the coves. The presence of non-native fish in these coves significantly compromises their suitability for razorbacks and requires additional treatments to remove the non-native fish. Conservation measures included in the proposed action will monitor the recreational use of these areas and if necessary, closures would be put into place. Monitoring will begin on the expansion area at Cottonwood Cove to document razorback use of the area. Additional mitigation may be identified for this programmatic project once specific compliance is initiated.

Expansion of the Cottonwood Cove and Eldorado Canyon facilities would provide for a total of 750 BAOT units of the 1,770 total units for Lake Mohave. This represents 42% of the carrying capacity. Razorbacks likely use the entire area over the course of the year; thus there could be effects from construction as described under the Lake Mead section.

The recreational zoning in the southern part of the lake is Urban Park. One of the larger razorback grow-out areas is located south of Katherine Landing. Access to Davis Cove is restricted; however recreationist access is possible. Effects to this site are largely limited to intentional introduction of non-native fish to the site.

Other effects to razorbacks in Lake Mohave are the same as those discussed under Lake Mead and are not repeated here.

Lake Mohave: potential effects to bonytail chub

Even with the stocking efforts, bonytail are rare in Lake Mohave. Most of the recent bonytail captures have been in the southern portion of the lake below Cottonwood Basin and within the area most likely influenced by recreational uses originating at Katherine Landing and other southern facilities. There is no recent information documenting spawning sites for the bonytail in Lake Mohave and no larvae have been captured to document nursery areas. Habitat preferences of the adults are not clear. Captured fish have come from near-shore waters sometimes associated with points of land extending into the lake. The spawning period for the bonytail is believed to be later in the spring than the razorback, so visitor use is higher. However, the highest period of visitor use is not within the spawning period.

The Service assumes that noise from motorized watercraft and other disturbances previously discussed under the razorback in Lake Mohave and Lake Mead would have an effect on bonytail; however, the magnitude of the effect and the likelihood of the adverse effect occurring is unknown. Additional information on habitat use and distribution within Lake Mohave would assist in answering these questions.

Lakes Mead and Mohave: potential effects to desert tortoise

Approximately 5 acres of desert tortoise habitat could be lost or degraded as a result of project development at Eldorado Landing. Expansion of other facilities within disturbed habitat may also pose a risk to any tortoises in the immediate vicinity. Tortoises could be crushed or entombed in their burrows by earth-moving equipment. Project vehicles and equipment could egress into areas outside the project areas and destroy habitat, or kill or injure tortoises. Desert tortoises would continue to be killed or injured as a result of vehicle encounters on NRA. Within the last 5 years, 5 tortoises have been found dead or injured on roads within the NRA. Trash and man-made structures may result in an increase in subsidized desert tortoise predators. Domestic dogs brought to the NRA by visitors and allowed to roam off leashes may harass, kill, or injure

desert tortoises. Measures proposed by the NPS to: (1) implement a tortoise education program, (2) flag disturbance areas and limit activities to these areas, (3) conduct desert tortoise clearance surveys, (4) evacuate and collapse or block existing tortoise burrows, (5) relocate tortoises out of harm's way, (6) monitor and record observations of desert tortoises, (7) cease activities that may harm tortoises if a tortoise occurs in an work area, (8) implement a litter-control program, and (9) coordinate with the Service if tortoises are impacted by vehicles, should minimize most of these effects.

Interrelated and interdependent actions

No interrelated or interdependent actions have been identified for the proposed action.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, Tribal, local or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

The action area is Federal land and no future State, Tribal, local or private recreational or other types of development is anticipated to occur along the shorelines of Lakes Mead and Mohave without Federal approvals. Reclamation manages the water and power operations in conjunction with water rights holders downstream and contracts to provide power. Those water and power operations will continue into the future and have effects similar to those seen in the environmental baseline.

The issue of contaminants entering Lake Mead from Las Vegas Wash is only partially a non-Federal issue. Various Federal agencies, including the EPA, have some degree of oversight in this issue, and Act consultation may be required in the future as options to address the problem are developed.

CONCLUSION

After reviewing the current status of the southwestern willow flycatcher, bonytail chub, razorback sucker and desert tortoise, the environmental baseline for the action area, the effects of implementation of the proposed LMP, and the cumulative effects, it is the Service's biological opinion that the action, as proposed, is not likely to jeopardize the continued existence of the southwestern willow flycatcher, bonytail chub, razorback sucker or desert tortoise, and is not likely to destroy or adversely modify designated critical habitat for bonytail, razorback or tortoise.

Our conclusion for the flycatcher is based on the limited amount of habitat within the NRA covered by the LMP proposed action, the degree of risk to occupied and suitable flycatcher habitat from recreationists using the NRA, and the level of protection to known habitat areas provided by the proposed action.

Our conclusion for the razorback is based on the known distribution of the species within the NRA covered by the LMP proposed action, the timing of high levels of recreational use compared to the razorback spawning period, and protections for spawning areas included in the proposed action.

Our conclusion for the bonytail is based on the known distribution of the species within the NRA covered by the LMP proposed action, the timing of high levels of recreational use compared to the presumed bonytail spawning period, and protections included in the proposed action.

Our conclusion for the tortoise is based on the limited amount of habitat within the NRA covered by the LMP proposed action, and the inclusion of established mitigation measures as conservation measures with the proposed action.

The conclusions of this biological opinion are based on full implementation of the project as described in the Description of the Proposed Action section of this document, including any conservation measures that were incorporated into the project design. For the programmatic portions of the proposed action, these conclusions are based on the concepts described and additional consultation may be needed for implementation or as a result of data gathered by monitoring efforts.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulations pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, and sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding and sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

AMOUNT OR EXTENT OF TAKE

Southwestern willow flycatcher

Because the number of flycatchers using the habitat on and adjacent to Lake Mead is dependent upon the quality and quantity of the habitat, and the quality and quantity of the habitat is controlled by the water levels of Lake Mead, these figures will vary from year to year over time.

For example, in the Virgin River delta, 14 birds were recorded in 1997 when the habitat was in good condition. Since then, because of Lake Mead water levels, the habitat has declined and only 6 birds were recorded in 2001 (McKernan and Braden 2002). Factors beyond the control of the NPS have a far greater influence on the quality and quantity of flycatcher habitat available on the NRA. That being said, recreation access poses a risk to the habitat and individual birds using that habitat in any particular year. Because water levels on Lake Mohave are more stable, the presence of flycatcher habitat there is more permanent.

The Service believes there is a potential for the take of individual southwestern willow flycatchers from the implementation of the proposed action. This take would be in the form of harassment to nesting and migrating birds from recreational users of the NRA and harm in the form of habitat lost to fires resulting from recreational activities. Access to suitable flycatcher nesting habitat in the upper Overton Arm (the Muddy and Virgin river confluences with Lake Mead) very limited, but not prohibited, which leaves a potential for disturbances to the habitat and individual birds from fire, noise and human presence. Known habitat areas on Lake Mohave are accessible to recreationists without any restrictions. It is also important to note that the flycatcher occupies these habitats during the high visitor use period on the NRA.

Because the numerical (in terms of numbers of birds or acres of habitat) basis for take for the flycatcher will vary from year to year, it is not possible to set a finite take amount. Instead, a percentage of the available habitat in a specific year will form the basis for the take. In any future year covered by the LMP, the incidental take level will be considered to be exceeded if five or more percent of the suitable (occupied or unoccupied) flycatcher habitat is destroyed through the actions of recreationists accessing the habitat through the NRA.

Bonytail chub and razorback sucker

The Service believes there is a potential for the take of individual bonytail chub and razorback suckers from the implementation of the proposed action. This take would be in the form of harassment, harm, and possibly, killing of individuals.

The harassment and harm come from the recreational use of shorelines used by bonytail and razorback for spawning and nursery areas as described in the Effects of the Action section of the biological opinion. The existence of the 100-foot no wake zone around the shoreline of the lakes, and the timing of highest recreational use during the period when fish are not heavily utilizing the shallows for breeding does reduce the risk somewhat.

Las Vegas Bay Marina and Echo Bay Marina are in immediate proximity to the only known spawning areas for the razorback in Lake Mead. Razorback suckers also spawn in the vicinity of Cottonwood Cove Marina on Lake Mohave; however, the largest known spawning areas are not in the immediate vicinity of the marina. Expansions of the Echo Bay and Cottonwood Cove facilities will increase recreational use in the areas. We do not have information on known spawning areas for the bonytail in Lake Mohave but capture records show significant use of the southern portion of the lake. The Katherine Landing facility is located within the known habitat area.

Potential mortality, especially for razorback sucker due to the close proximity of spawning areas to marinas, could occur from spills or chronic releases of toxic materials (petroleum products) at existing marinas. Dispersal of petroleum products into heavily used portions of the lakes by outboard motors, personal watercraft and illegal refueling activities also poses a risk to individual fish in the area of the boating activity. As described earlier, known bonytail chub and razorback sucker habitats are in proximity to several high use areas, including areas where the proposed action would increase recreational use through additional facilities.

Take resulting from placement of fishing access or fish habitat structures under the programmatic portion of this opinion would be significantly reduced by the conservation measures to prohibit placement of these facilities in proximity to known razorback sucker spawning habitats. Capture of a razorback sucker by an angler is very unlikely. Capture of a bonytail by an angler is more likely, but the risk is still very limited. There are records for the Colorado River of anglers taking bonytail from Lake Havasu and the river above the lake. Placement of informational signs at fishing sites informing anglers of the status of the bonytail and razorback and to immediately release any that are captured also reduces the risk of a fish dying.

The Service anticipates that any incidental take of bonytail chub and razorback sucker from the risk factors discussed above and in the Effects of the Action section of the biological opinion will be difficult to detect under normal circumstances. Take from anglers may or may not be reported. Unless there is a catastrophic spill of toxic materials, finding a dead or impaired individual is highly unlikely, especially in the case of affected eggs or newly hatched larvae or fry being affected. At the current levels of toxic pollution being introduced, mortality or impairment has not been observed; however, no monitoring program exists to document this conclusion. Efforts to control the introduction of pollutants included in the proposed action may, over the long-term, reduce some of these risks. Monitoring of pollutants included in the proposed action may determine if problems exist, and future consultation may be needed if effects are documented.

For Lake Mead, the razorback population is estimated at less than 150 to 180 (75 to 90 per population group) individuals. Those individuals are seasonally concentrated near Las Vegas Bay Marina and Echo Bay Marina. Protective measures will be in place to reduce boat traffic in sensitive areas during the spawning season. Because the population is so small and finding affected individuals very difficult, the incidental take level is provided both in terms of a number of razorbacks and a surrogate measure based on total number of fish killed or injured based on a pollution event. The level of incidental take provides for an annual loss of one razorback to activities covered under the LMP. For pollution related incidents that affect areas known to be frequented by razorbacks, if a fish kill involving more than 100 individuals of all fish species occurs, the level of incidental take will be exceeded. If razorback suckers are found among the dead or injured fish, the incidental take will be exceeded if more than one razorback is found.

For Lake Mohave, an incidental take of one razorback per year or one bonytail per year is appropriate. The razorback and bonytail populations in Lake Mohave are expanding due to ongoing stocking programs. As populations grow, there is an increased risk of an individual fish

being taken due to activities covered under the LMP. In order to accommodate this increased risk, the Service believes that annually increasing the level of take of one razorback per 1000 fish stocked, and one bonytail per 1000 fish stocked for stockings beginning in 2003 is appropriate.

Desert tortoise

The LMP proposes to include Service mitigation measures for tortoise in all new construction projects where medium to high quality tortoise habitat may be impacted. These measures include pre-construction surveys, on-site monitoring, and removal of tortoises from danger areas. These measures would be in effect for the five acres of new construction at Eldorado Landing and expansion of other facilities included in the proposed action. With the information provided on road-related tortoise mortalities, it is anticipated that 1 tortoise a year will be killed on roads in the NRA. The conservation measures proposed with the proposed action will reduce the risk to tortoises.

EFFECT OF THE TAKE

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the species or destruction or adverse modification of critical habitat.

REASONABLE AND PRUDENT MEASURES/TERMS AND CONDITIONS

At the programmatic level, the FWS has not identified any reasonable and prudent measures or terms and conditions to reduce the level of incidental take identified in the incidental take statement. Action-specific measures and terms and conditions for future Federal actions will be developed by FWS to appropriately reduce the risk of take as appropriate in accordance with FWS guidance (Appendix B). NPS will submit a request to include future actions that may adversely affect listed species in this programmatic consultation and are within the scope of the opinion.

DISPOSITION OF DEAD OR INJURED LISTED SPECIES

Upon locating a dead, injured, or sick listed species in Arizona, initial notification must be made within three working days of its finding to the Service's Law Enforcement Office at:

Federal Building, Room 8
26 North McDonald
Mesa, Arizona 85201
(480) 835-8289

Written notification must be made within five calendar days and include the date, time, and location of the animal, a photograph if possible, and any other pertinent information. The notification shall be sent to the Law Enforcement Office with a copy to this office. Care must be taken in handling sick or injured animals to ensure effective treatment and care, and in handling dead specimens to preserve the biological material in the best possible state.

Upon locating a dead or injured endangered or threatened species in Nevada, initial notification must be made to the Service's Division of Law Enforcement in Las Vegas, Nevada, at (702) 388-6380. Care should be taken in handling sick or injured desert tortoises to ensure effective treatment and care or the handling of dead specimens to preserve biological material in the best possible state for later analysis of cause of death. In conjunction with the care of sick or injured desert tortoises or preservation of biological materials from a dead animal, the finder has the responsibility to carry out instructions provided by the Service's Division of Law Enforcement to ensure that evidence intrinsic to the specimen is not unnecessarily disturbed. All deaths, injuries, and illnesses of desert tortoises, whether associated with project activities or not, will be summarized in the annual report.

The following actions should be taken for injured or dead tortoises if directed by the Service's Division of Law Enforcement:

Injured desert tortoises shall be delivered to any qualified veterinarian for appropriate treatment or disposal. Dead desert tortoises suitable for preparation as museum specimens shall be frozen immediately and provided to an institution holding appropriate Federal and State permits per their instructions. Should no institutions want the desert tortoise specimens, or if it is determined that they are too damaged (crushed, spoiled, etc.) for preparation as a museum specimen, then they may be buried away from the project area or cremated, upon authorization by the Service's Division of Law Enforcement. The project proponent shall bear the cost of any required treatment of injured desert tortoises, euthanasia of sick desert tortoises, or cremation of dead desert tortoises. Should sick or injured desert tortoises be treated by a veterinarian and survive, they may be transferred as directed by the Service.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information. This project already contains several conservation measures. The Service has not identified any additional conservation recommendations for this project.

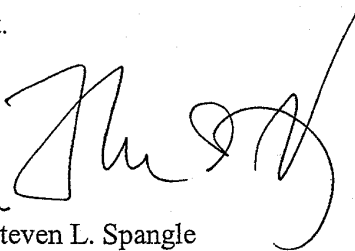
In order for the Service to be kept informed of actions minimizing or avoiding adverse effects, or benefitting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

REINITIATION NOTICE

This concludes formal consultation on the actions outlined in the request. As provided in 50 CFR§402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is provided by law) and if: (1) the

amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat is designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

The Service appreciates the National Park Service's efforts to identify and minimize effects to listed species from this project. For further information, please contact Lesley Fitzpatrick (x236) or Tom Gatz (x240). Please refer to the consultation number 2-21-01-F-263 in future correspondence concerning this project.


For
Steven L. Spangle

cc: Director, Fish and Wildlife Service, Arlington, VA (ARD-ES)
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Lower Colorado River Coordinator, Fish and Wildlife Service, Phoenix, AZ

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TABLES

Table 1: Lake Mohave Summary of Facilities: assumes PA (Alt C) authorized numbers and baseline (Alt A) existing numbers to generate net change.

Numbers presented as: Baseline/Proposed Action/Net change

Facility Name	Launch lanes	Pull through spaces	Single parking spaces	Wet slips	Dry slips
El Dorado	0/4/+4	0/100/+100	0/0/0	0/0/0	0/0/0
Cottonwood	15/15/0	222/322/+100	153/500/+347	234/484/+250	300/300/0
Willow Beach	8/8/0	155/155/0	50/200/+150	0/125/+125	0/0/0
Princess Cove	8/8/0	100/100/0	50/50/0	0/0/0	0/0/0
N. Telephone	2/2/0	100/100/0	78/78/0	0/0/0	0/0/0
Katherine	8/8/0	418/469/+51	325/325/0	1058/1443/+385	150/150/0

Table 2: Lake Mead Summary of Facilities: assume PA (Alt C) authorized numbers and baseline (Alt A) existing numbers to generate net change.

Numbers presented as: Baseline/Proposed Action/Net change

Facility	Launch lanes	Pull through spaces	Single parking spaces	Wet slips	Dry slips
Overton Beach	4/4/0	200/200/0	181/281/+100	135/185/+50	0/80/+80
Stewarts Point	0/4/+4	0/150/+150	0/0/0	0/0/0	0/0/0
Echo Bay	6/6/0	173/375/+202	217/217/0	360/540/+180	60/60/0
Callville Bay	13/13/0	333/333/0	337/462/+125	647/847/+200	120/120/0
Govt Wash	8/8/0	150/150/0	0/0/0	0/0/0	0/0/0
Las Vegas Bay	4/4/0	222/222/0	285/285/0	635/635/0	388/388/0
Lake Mead Resort	4/4/0	85/85/0	145/145/0	755/755/0	55/55/0
Hemenway Wash	4/4/0	175/175/0	0/0/0	0/0/0	0/0/0
Temple Bar	6/6/0	219/288/+69	125/425/+300	95/395/+300	200/200/0
South Cove	8/8/0	116/116/0	53/53/0	0/0/0	0/0/0
Pearce Ferry	0/2/+2	50/50/0	0/0/0	0/0/0	0/0/0

APPENDIX A

Justification for concurrence with finding of “may affect, not likely to adversely affect” from proposed Lake Mead National Recreation Area Lake Management Plan.Bald eagle

Bald eagles are found on the NRA during the winter months and are not known to nest in the vicinity. Because of the lack of large riparian trees around most of the lake shores, cliffs are the primary available habitat for eagles. Cliff areas would not be affected by the proposed action. Operation of the existing recreational facilities and the additional BAOT levels provided for by facilities expansion is not likely to affect wintering birds. Fish populations that provide food for eagles would not likely be affected by the proposed action. Under these conditions, effects are insignificant and discountable and no take is anticipated.

Yuma clapper rail

Yuma clapper rails have been found in cattail marshes in the vicinity of Las Vegas Wash and the Virgin and Muddy Rivers above Lake Mead (McKernan and Braden 2001b). A record for the lower Grand Canyon exists from 1997 (McKernan and Braden 2001a). No records exist for the NRA, however suitable habitat likely exists along the upper end of the Overton Arm and possibly in the lower portion of Las Vegas Wash nearest to Las Vegas Bay.

Access to the suitable habitat in the Overton Arm would be restricted under the proposed action through the primitive/semi-primitive designation for the area. Personal watercraft, waterskiing, houseboats and wakeboarding are prohibited, and outboard motors over 65 horsepower would not be allowed in the area. This would significantly curtail boat use of the suitable habitat area, reducing human disturbances. Clapper rails breed in the spring (generally March through early July) and adults lose their flight feathers in late summer (Eddleman 1989) and are unable to fly. These sensitive times are during the high visitor use periods on Lake Mead. By reducing public access through the primitive/semi-primitive designation, the proposed action reduces the risk of human disturbances including fire danger, boat wake damage to shorelines and nests in cattails, and engine noise. Clapper rails successfully occupy and breed in habitats on the lower Colorado River with recreational uses less restricted than those proposed in the LMP. Under these conditions, effects are insignificant and discountable and no take is anticipated.

In Las Vegas Wash, suitable habitat within the NRA is limited due to hydrology of the wash. Most surveys have been focused on extant habitat areas upstream of the NRA boundary where various flood control structures maintain marsh habitats. Boat access to the lower wash area is dependent on water surface elevations in Lake Mead, and this also controls the development of marsh habitats suitable for clapper rails. With the uncertainty of suitable habitat being present, the potential for effects to occur from the proposed action is unlikely. If, in the future, clapper rail habitat develops in the lower portions of the wash, this finding may need to be revisited.

APPENDIX B

Fish and Wildlife Service: Programmatic Consultations

This biological opinion was prepared in accordance with the October 18, 2001, guidance for programmatic-level consultations. The term, “programmatic consultation” has become a generic term encompassing a broad category of section 7 consultations that evaluate the potential for Federal agency programs to affect listed and proposed species, and designated and proposed critical habitat. Such programs typically guide implementation of future agency actions by establishing standards, guidelines, or governing criteria to which future actions must adhere. At times the term *programmatic consultation* has been used to refer to consultations on a large group of similar actions (e.g., a national forest’s timber harvest program for a particular year) as well as to refer to consultations covering different types of actions proposed within a large geographic area such as a watershed. Such consultations can provide the benefit of streamlining the consultation process while leading to a more landscape-based approach to consultation that can minimize the potential “piecemeal” effects that can occur when evaluating individual projects out of the context of the complete agency program.

This programmatic biological analyzes the potential effects of implementing NPS’s proposed LMP, and develops the appropriate project-specific documentation that addresses the effects of individual projects. This programmatic biological opinion contains all of the elements found in a standard biological opinion. The format of this programmatic biological opinion conforms with the *tiered programmatic approach*, which will require that the Service produce project-specific documentation **before** the action occurs.

Project-level Consultation under the Tiered Programmatic Consultation Approach

As individual projects are proposed under the tiered programmatic consultation approach, NPS provides project-specific information that: (1) describes each proposed action and the specific areas to be affected; (2) identifies the species and critical habitat that may be affected; (3) describes the manner in which the proposed action may affect listed species and designated critical habitat; (4) describes the anticipated effects; (5) specifies, if appropriate, that the *anticipated effects from the proposed project are consistent with those anticipated in the programmatic biological opinion*; and, (6) describes any additional effects, if any, not considered in the programmatic consultation.

The Service reviews the information and effects analysis provided for each proposed project and this project-specific review is documented in accordance with the guidance provided below. To initiate the project-specific review, NPS’s project information and effects analysis should be accompanied by a cover letter that specifies that the action agency has determined that the proposed project is consistent with the programmatic biological opinion. In this programmatic biological opinion, the Service determined the overall anticipated incidental take for all proposed NPS activities over the term of the biological opinion, at the programmatic level. As each action is

submitted by the NPS to the Service for review under this programmatic biological opinion, the Service will determine the anticipated incidental take for each action, at the project level, as a subset of the incidental take anticipated in the programmatic biological opinion.

Individual NPS actions that are *likely to adversely affect* listed species or designated critical habitat, shall require an abbreviated biological opinion specific for each such action that contains:

- (1) a statement acknowledging the programmatic biological opinion and how the project-specific and programmatic biological opinions are related;
- (2) a summary of the information on which the opinion is based as provided by NPS;
- (3) a brief project summary;
- (4) a detailed discussion of the effects of the proposed action on listed species and critical habitat;
- (5) a statement regarding the consistency (or inconsistency) of the effects of the proposed action with the effects analyzed in the programmatic biological opinion;
- (6) the Service's opinion on whether the action is likely to jeopardize the continued existence of the listed species or result in destruction or adverse modification of critical habitat;
- (7) project-specific incidental take statement with reasonable and prudent measures needed to ensure the minimization of the impacts of the take that will result from the proposed project;
- (8) any procedures needed to monitor the impacts of the proposed action not identified in the programmatic biological opinion; and
- (9) a statement regarding the specific project's impacts to the environmental baseline and a tallying of the overall impacts to the environmental baseline from previous projects under the programmatic biological opinion.

Although there is no standard for the required project-specific documentation, the Service generally should complete its response in approximately five pages. Therefore, the programmatic biological opinion, together with the project specific documentation, fulfills the consultation requirements for implementation of both program-level and project-level actions.

APPENDIX C

Section 7 Fee Payment Form for Desert Tortoise

SECTION 7 FEE PAYMENT FORM

Entire form is to be completed by project proponent

Biological Opinion File Number: 2-21-01-F-263Fish and Wildlife Service Office that Issued the Opinion: Phoenix, ArizonaSpecies: Desert tortoise (*Gopherus agassizii*)Project: Lake Mead National Recreation Area Lake Management Plan, Clark County, Nevada
and Mohave County, Arizona

Amount of Payment Received: _____

Total Payment Required: \$ _____

Date of Receipt: _____

Check or Money Order Number: _____

Number of Acres to be Disturbed: _____

Project Proponent: _____

Telephone Number: _____

Authorizing Agencies: National Park Service, Lake Mead National Recreation Area

Make checks payable to: Clark County Treasurer

Deliver check to:
Clark County Habitat Conservation
Department of Comprehensive Planning
Clark County Government Center, Third floor
500 South Grand Central Parkway
Las Vegas, Nevada 89155 (Attn: Christina Gibson)
(702) 455-4181If you have questions, you may call the Southern Nevada Field Office of the U.S. Fish and
Wildlife Service at (702) 515-5230.

APPENDIX G: APPROACH TO EVALUATING SURFACE WATER QUALITY IMPACTS

OBJECTIVE

Using simplifying assumptions, estimate the minimum (threshold) volume of water in a reservoir or lake below which concentrations of gasoline constituents from personal watercraft or outboards would be potentially toxic to aquatic organisms or humans. Using the estimated threshold volumes, and applying knowledge about the characteristics of the receiving waterbody and the chemical in question, estimate if any areas within the waterbody of interest may present unacceptable risks to human health or the environment.

OVERALL APPROACH

Following are the basic steps in evaluating the degree of impact a waterbody (or portion of a waterbody) would experience based on an exceedance of water quality standards / toxicity benchmarks for personal watercraft- and outboard-related contaminants.

Determine concentrations of polycyclic aromatic hydrocarbons (PAH), benzene, and methyl tertiary-butyl ether (MTBE) in gasoline (convert from weight percent to mg/L, as needed) and PAH in exhaust. The half-life of benzene in water is 5 hours at 25°C (Verschuren 1983; US EPA 2001).

Estimate loading of PAH, benzene, and MTBE for various appropriate PWC-hour levels of use for one day (mg/day)

Find/estimate ecological and human health toxicity benchmarks (risk-based concentrations [RBCs]) (micrograms [ug]/L) for PAH, benzene, and MTBE.

Divide the estimated loading for each constituent (ug) by a toxicity benchmark (ug/L) to determine the waterbody threshold volume (L) below which toxic effects may occur (convert liters to acre-feet).

Estimated hydrocarbon (HC) emissions from personal watercraft and outboards will be significantly reduced in the near future, based on regulations issued by the U.S. Environmental Protection Agency and the California Air Resources Board (CARB) Other states may also have emission reduction programs that must be applied.

ASSUMPTIONS AND CONSTANTS

Several assumptions must be made in order to estimate waterbody threshold volumes for each HC evaluated. Each park should have park-specific information that can be used to modify these assumptions or to qualitatively assess impacts in light of park-specific conditions, such as mixing and stratification, and the characteristics of the chemicals themselves. The assumptions are as follows:

BTEX (benzene, toluene, ethyl benzene, and xylene) are volatile and do not stay in the water column for long periods of time. Because benzene is a recognized human carcinogen, it is retained for the example calculations below and should be considered in each environmental assessment or environmental impact statement (Verschuren 1983; US EPA 2001).

MTBE volatilizes slightly and is soluble in water. MTBE may accumulate in water from day to day, but this is not factored into the calculation and should be considered qualitatively in the assessment.

PAH volatilize slightly (depending on structure and molecule size) and may adhere to sediment and settle out of the water column or float to the surface and be photo-oxidized. They may accumulate in water from

day to day, but this is not factored into the calculation and should be considered qualitatively in the assessment.

The toxicity of several PAH increases (by several orders of magnitude) when the PAH are exposed to sunlight. This was not incorporated because site-specific water transparency is not known and should be discussed qualitatively.

The threshold volume of water will mix vertically and aerially with contiguous waters to some extent, but the amount of this mixing will vary from park to park and location to location in the lake, reservoir, or river. Therefore, although the threshold volume calculation assumes no mixing with waters outside the “boundary” of the threshold volume of water, this should be discussed in the assessment after the threshold volume is calculated. The presence or absence of a thermocline should also be addressed.

Volume of the waterbody, or portion thereof, is estimated by the area multiplied times the average depth.

In addition to these assumptions, several constants required to make the calculations were compiled from literature and agency announcements. Gasoline concentrations are provided for benzene, MTBE, and those PAH for which concentrations were available in the literature. Constants used are

gasoline emission rate for two-stroke personal watercraft: 3 gal/hour at full throttle (CARB 1998)

gasoline emission rate for two-stroke outboards: estimated at approximately the same as for personal watercraft for same or higher horsepower outboards (80–150 hp); approximately twice that of personal watercraft for small (e.g., 15 hp) outboards. (Note: Assume total hours of use for the various size boats/motors, and that smaller 15 hp motors that exhaust relatively more unburned fuel would probably be in use for a much smaller amount of time than the recreational speedboats and personal watercraft). This estimate is based on data from Allen et al. 1998 (figure 5). It is noted that other studies may indicate different relative emission rates (e.g., about the same emissions regardless of horsepower, or larger horsepower engines having higher emission rates than smaller engines [CARB 2001]). The approach selected represents only one reasonable estimate.

1 gallon = 3.78 liters

specific gravity of gasoline: 739 g/L

1 acre-foot = 1.234×10^6 L

concentration of benzo(a)pyrene (B[a]P) in gasoline: up to 2.8 mg/kg (or 2.07 mg/L) (Gustafson et al. 1997)

concentration of naphthalene in gasoline: 0.5% or 0.5 g/100 g (or 3,695 mg/L) (Gustafson et al. 1997)

concentration of 1-methyl naphthalene in gasoline: 0.78% or 0.78 g/100 g (or approx. 5,760 mg/L) (estimated from Gustafson et al. 1997)

concentration of benzene in gasoline: 2.5% or 2.5 g/100 g (or 1.85×10^4 mg/L) (Hamilton 1996)

concentration of MTBE in gasoline: up to 15% or 15 g/100 g (or approx. 1.10×10^5 mg/L) (Hamilton 1996). (Note: MTBE concentrations in gasoline vary from state to state. Many states do not add MTBE.)

Estimated emission of B(a)P in exhaust: 1,080 ug/hr (from White and Carroll, 1998, using weighted average B(a)P emissions from 2-cylinder, carbureted two-stroke liquid cooled snow mobile engine using gasoline and oil injected Arctic Extreme injection oil, 24-38:1 fuel:oil ratio. Weighted average based on percentage of time engine was in five modes of operation, from full throttle to idle).

Estimated amount of B(a)P exhaust emissions retained in water phase = approximately 40% (based on value for B(a)P from Hare and Springier, quoted in North American Lake Management Society 2001).

TOXICITY BENCHMARKS

A key part of the estimations is the water quality criterion, standard, or toxicological benchmark for each contaminant evaluated. There are no EPA water quality criteria for the protection of aquatic life for the PWC-related contaminants (US EPA 1999a). There are, however, a limited number of EPA criteria for the protection of human health (via ingestion of water and aquatic organisms or ingestion of aquatic organisms only). Chronic ecotoxicological and human health benchmarks for contaminants were acquired from various sources.

Ecological benchmarks for benzo(a)pyrene, naphthalene, and benzene are from *Toxicological Benchmarks for Screening Potential Contaminants of Concern for Effects on Aquatic Biota: 1996 Revision* (Suter and Tsao 1996). The ecological benchmarks for benzo(a)pyrene (0.014 ug/L) and benzene (130 ug/L) are Tier II Secondary Chronic Values in Table 1 of Suter and Tsao (1996), which were calculated using methods in the *Great Lakes Water Quality Initiative* (EPA 1993). The ecological benchmark for naphthalene (62 ug/L) is the EPA Region 4 chronic screening value (Table 3 of Suter and Tsao 1996). This screening value was chosen for use as a conservative mid-range value considering the wide range of chronic values for naphthalene (12-620 ug/L) shown in Suter and Tsao (1996). The ecological benchmarks for 1-methyl naphthalene (19 and 34 ug/L) are based on LC₅₀ values of 1,900 and 3,400 ug/L for the marine invertebrate, dungeness crab (*Cancer magister*), and the fresh water/estuarine fish, sheepshead minnow (*Cyprinodon variegatus*), respectively (USFWS 1987). The MTBE benchmarks of 18,000 and 51,000 ug/L are for marine and fresh water, respectively, and are based on the preliminary chronic water quality criteria presented in Mancini et al. (2002).

Following are the default toxicity benchmarks for the PAH, benzene, and MTBE having gasoline concentration information:

Chemical	Ecological Benchmark (ug/L)	Source	Human Health Benchmark ¹ (ug/L)	Source
Benzo(a)pyrene	0.014	Suter and Tsao 1996	0.0044 ^b 0.049 ^c	US EPA 1999a
Naphthalene	62	Suter and Tsao 1996	—	—
1-methyl naphthalene	19 ² 34 ²	USFWS 1987	—	—
Benzene	130	Suter and Tsao 1996	1.2 ¹ 71 ³	US EPA 1999a
MTBE ⁴	18,000 51,000	Mancini et al. 2002	13	CA DHS 2002
<p>1. Based on the consumption of water and aquatic organisms.</p> <p>2. Based on LC₅₀S of 1900 and 3400 ug/L for dungeness crab and sheepshead minnow, respectively (19 ug/L used for marine/estuarine calculations; 34 ug/L used for freshwater calculations).</p> <p>3. Based on the consumption of aquatic organisms only.</p> <p>4. Ecological benchmarks, which are considered preliminary chronic water quality criteria, are 18,000 ug/L for marine and 51,000 ug/L for freshwater. There is no EPA human health benchmark, but California Department of Health Services (2002) has established a primary maximum contaminant level (MCL) of 13 ug/L.</p>				

EXAMPLE CALCULATIONS

Calculations of an example set of waterbody volume thresholds are provided below for the chemicals listed above, together with their concentrations in gasoline and available toxicity benchmarks.

Loading to Water

Loadings of the five contaminants listed above are calculated for one day assuming 10 personal watercraft operate for four hours (40 PWC-hours), each discharging 11.34 L gasoline per hour and having concentrations in fuel or exhaust as listed.

Benzo(a)pyrene (from the fuel): $40 \text{ PWC-hrs} \times 11.34 \text{ L gas/hr} \times 2.07 \text{ mg/L} = 939 \text{ mg}$

Benzo(a)pyrene (from the gas exhaust): $40 \text{ PWC-hrs} \times 1080 \text{ ug/hr} \times 1/1000 \text{ mg/ug} \times 0.40 = 17 \text{ mg}$

Total B(a)P = 956 mg

Naphthalene: $40 \text{ PWC-hrs} \times 11.34 \text{ L gas/hr} \times 3695 \text{ mg/L} = 1.68 \times 10^6 \text{ mg}$

1-methyl naphthalene: $40 \text{ PWC-hrs} \times 11.34 \text{ L gas/hr} \times 5764 \text{ mg/L} = 2.62 \times 10^6 \text{ mg}$

Benzene: $40 \text{ PWC-hrs} \times 11.34 \text{ L gas/hr} \times 1.85 \times 10^4 \text{ mg/L} = 8.39 \times 10^6 \text{ mg}$

MTBE: $40 \text{ PWC-hrs} \times 11.34 \text{ L gas/hr} \times 1.10 \times 10^5 \text{ mg/L} = 4.99 \times 10^7 \text{ mg}$

Loadings of contaminants from two-stroke outboards should be estimated based on the estimated loading based on the horsepower of the outboards involved (see “Assumptions and Constants” above) and the estimated hours of use, based on the types of boats and the pattern of use observed.

Threshold Volumes

Threshold volumes of water (volume at which a personal watercraft- or outboard-related contaminant would equal the benchmarks listed above) are calculated by dividing the estimated daily loadings (mg of contaminant) for the number of operational hours (e.g., 40 PWC-hours) by the listed toxicity benchmark concentrations (ug/L), correcting for units ($1 \text{ mg} = 10^3 \text{ ug}$), and converting from liters to acre-feet ($1 \text{ ac-ft} = 1.234 \times 10^6 \text{ L}$):

Protection of Freshwater Aquatic Organisms

Benzo(a)pyrene: $956 \text{ mg B(a)P} \times 10^3 \text{ ug/mg} / 0.014 \text{ ug/L} = 6.8 \times 10^7 \text{ L}$ or 55 ac-ft

Naphthalene: $1.68 \times 10^6 \text{ mg naphthalene} \times 10^3 \text{ ug/mg} / 62 \text{ ug/L} = 2.71 \times 10^7 \text{ L}$ or 22 ac-ft

1-methyl naphthalene: $2.62 \times 10^6 \text{ mg 1-methyl naphthalene} \times 10^3 \text{ ug/mg} / 34 \text{ ug/L} = 7.69 \times 10^7 \text{ L}$ or 62 ac-ft

Benzene: $8.39 \times 10^6 \text{ mg benzene} \times 10^3 \text{ ug/mg} / 130 \text{ ug/L} = 6.45 \times 10^7 \text{ L}$ or 52 ac-ft

MTBE: $4.99 \times 10^7 \text{ mg MTBE} \times 10^3 \text{ ug/mg} / 51,000 \text{ ug/L} = 9.78 \times 10^5 \text{ L}$ or 0.79 ac-ft

Based on these estimates and assumptions, 1-methyl naphthalene appears to be the contaminant (of those analyzed) that would be the first to accumulate to concentrations potentially toxic to freshwater aquatic organisms (i.e., it requires more water [62 ac-ft] to dilute the contaminant loading to a concentration below the toxicity benchmark). However, the threshold volumes are very similar for 1-methyl naphthalene, benzo(a)pyrene, and benzene.

Protection of Human Health

Benzo(a)pyrene: $956 \text{ mg B(a)P} \times 10^3 \text{ ug/mg} / 0.0044 \text{ ug/L} = 2.17 \times 10^8 \text{ L}$ or 176 ac-ft

Benzene: $8.39 \times 10^6 \text{ mg benzene} \times 10^3 \text{ ug/mg} / 1.2 \text{ ug/L} = 6.99 \times 10^9 \text{ L}$ or 5,670 ac-ft

MTBE: $4.99 \times 10^7 \text{ mg MTBE} \times 10^3 \text{ ug/mg} / 13 \text{ ug/L} = 3.83 \times 10^9 \text{ L}$ or 3,110 ac-ft (If the CA MCL of 13 ug/L for fresh water is used)

The California public health goal for MTBE is a drinking water-based MCL and is not as broadly applicable as the other criteria used in this analysis. However, it may be of interest, since MTBE is very soluble, and MTBE concentration could be an issue if the receiving body of water is used for drinking water purposes and MTBE is not treated. Using the numbers provided above, benzene would be the first PWC-related contaminant in these example calculations that would reach unacceptable levels in surface water; however, volatilization of benzene from water to air was not included in the calculation. MTBE would be the next contaminant to reach unacceptable concentrations. If human health water quality criteria for ingestion of aquatic organisms only were used for benzo(a)pyrene and benzene (0.049 ug/L and 71 ug/L, respectively), the corresponding threshold volumes would be 15.8 ac-ft and 95.8 ac-ft.

As a result of the estimated reductions in HC emissions (from the unburned fuel) in response to EPA regulations (listed above), additional personal watercraft and/or outboards may be used in the parks without additional impacts to water quality. For example, based on the expected overall reductions from EPA (1996a, 1997), up to twice the current number of personal watercraft/outboards may be used in a given area in 2012 without additional impacts to water quality over current levels. Effects on noise levels, physical disturbance, or hydrocarbon emissions that are products of combustion (e.g., B[a]P) may not be similarly ameliorated by the reduced emission regulations.

APPLICATION OF APPROACH

Use of the approach described above for evaluating possible exceedance of standards or other benchmarks must be adapted to the unique scenarios presented by each park, personal watercraft use, and waterbody being evaluated. State water quality standards (including the numeric standards and descriptive text) must be reviewed and applied, as appropriate.

Factors that would affect the concentration of the contaminants in water must be discussed in light of the park-specific conditions. These factors include varying formulations of gasoline (especially for MTBE); dilution due to mixing (e.g., influence of the thermocline), wind, currents, and flushing; plus loss of the chemical due to volatilization to the atmosphere (Henry's Law constants can help to predict volatilization to air; see Yaws et al. 1993); adsorption to sediments and organic particles in the water column (e.g., PAH), oxidation, and biodegradation (breakdown by bacteria). Toxicity of phototoxic PAH may be of concern in more clear waters, but not in very turbid waters.

The chemical composition of gasoline will vary by source of crude oil, refinery, and distillation batch. No two gasolines will have the exact same chemical composition. For example, B(a)P concentrations may range from 0.19 to 2.8 mg/kg, and benzene concentrations may range from 0%–7% (2%–3% is typical). MTBE concentrations will vary from state to state and season to season, with concentrations ranging from 0%–15%.

The composition of gasoline exhaust is dependent on the chemical composition of the gasoline and engine operating conditions (i.e., temperature, rpms, and oxygen intake). If site-specific information is available on gasoline and exhaust constituents, they should be considered in the site-specific evaluation. If additional information on the toxicity of gasoline constituents (e.g., MTBE) becomes available, they should be considered in the site-specific evaluation.

The results of the studies included in the collection of papers entitled “Personal Watercraft Research Notebook” provided by the NPS staff, provides some framework for your analysis. The following table summarizes some of the results presented in various documents on the concentrations of benzene, PAH, and MTBE.

Levels Found			
Pollutant	Source(s)	Lower Use (e.g. open water, offshore locations; reduced motorized watercraft use)	Higher Use (e.g., nearshore, motorized watercraft activity high)
Benzene	<i>Lake Tahoe Motorized Watercraft Report</i> (Allen et al. 1998); several studies reported		
	1. USGS	1. <0.032 ug/l	1. 0.13 – 0.33 ug/l
	2. Miller and Fiore	2. ≤0.3 ug/l	2. just over 1 ug/l
	3. U of CA	3. <0.1 ug/l	3. 0.1 – 0.9 ug/l
PAH	A. Mastran et al.	A. All below detection limits (<0.1 ug/l for pyrene and naphthalene; <2.5 ug/l for B(a)P, B(a)A, chrysene)	A. Total PAH – up to 4.12 ug/l in water column; total PAH – up to 18.86 ug/l in surface sample at marina, with naphthalene at 1ug/l; B(a)P – ≥2.3 ug/l
	B. Ortis et al.	B. Experiment #1 – 2.8 ng/l phototoxic PAH	B. Experiment #1 – ± 45 ng/l phototoxic PAH; 5–70 ng/L total PAH
MTBE	A. <i>Lake Tahoe Motorized Watercraft Report</i> (Allen et al. 1998); several studies reported		
	1. USGS	1. 0.11 – 0.51 ug/l	1. 0.3 – 4.2 ug/l
	2. Miller and Fiore	2. <3 ug/l	2. 20 ug/l (up to approx. 31ug/l)
	3. U of CA	3. less than nearshore area	3. up to 3.77 ug/l
	4. U of Nevada – Fallen Leaf Lake	4. --	4. 0.7 – 1.5 ug/l
	5. Donner Lake (Reuter et al. 1998)	5. <0.1 ug/l	5. up to 12 ug/l (Dramatic increase from 2 to 12 ug/l from July 4 to 7)
	B. NPS, VanMouwerik and Hagemann 1999		
	6. Lake Perris	6. 8 ug/l (winter)	6. up to 25 ug/l
	7. Shasta Lake		7. 9 – 88 ug/l over Labor Day weekend
	8. 3-day Jet Ski event		8. 50 - 60 ug/l
	9. Lake Tahoe		9. often within range of 20 - 25 ug/l, with max of 47 ug/l

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APPENDIX H: RESULTS OF SURFACE WATER QUALITY EVALUATION

TABLE H-1: LAKE MEAD SURFACE WATER QUALITY ANALYSIS—ALTERNATIVE A—2004
THRESHOLD VOLUME CALCULATIONS IN ACRE-FEET

Engine Type	Percent of BAOT	Hours per trip	Max Daily Hours	B(a)P in gasoline	B(a)P in exhaust	Total B(a)P	Napthalene	1-methyl Napthalene	Benzene	MTBE	Total B(a)P Arizona Fish consumption	Total B(a)P HH criteria	Benzene HH criteria
Outboard Engines													
Carbureted 2-stroke	6.6	2.3	625	849	16	865	342	973	392	12	6,052	2,751	42,490
Direct Injection 2-stroke	3.7	2.9	452	61	1	63	25	70	28	1	438	199	3,077
Elec. Fuel Injection 2-stroke	3.7	2.9	452	61	1	63	25	70	28	1	438	199	3,077
Carb. or EFI 4-stroke	7.4	2.9	905	123	2	125	50	141	57	2	876	398	6,153
Inboard/Sterndrive													
Carb. or EFI 4-stroke	72.3	4.7	14,382	1,954	36	1,990	788	2,239	903	29	13,930	6,332	97,799
Jet gas 4-stroke	4.1	4.0	689	94	2	95	38	107	43	1	667	303	4,684
Outboard Auxiliary Sail	2.3	3.6	345	47	1	48	19	54	22	1	334	152	2,348
Personal Watercraft													
Carbureted 2-stroke	0.0	2.4	0	0	0	0	0	0	0	0	0	0	0
Direct Injection 2-stroke	0.0	2.7	0	0	0	0	0	0	0	0	0	0	0
4-stroke	0.0	2.7	0	0	0	0	0	0	0	0	0	0	0
Totals	Total 2 stroke carbureted PWC			0	0	0	0	0	0	0	0	0	0
	Total all PWC			0	0	0	0	0	0	0	0	0	0
	Total all 2 stroke carbureted engines			849	16	865	342	973	392	12	6,052	2,751	42,490
	Total all other engines			2,340	43	2,384	943	2,682	1,081	34	16,685	7,584	117,137
	Total all engines			3,189	59	3,248	1,286	3,654	1,473	47	22,737	10,335	159,627
Using BAOT of 4,201													

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THRESHOLD VOLUME CALCULATIONS IN ACRE-FEET														
Engine Type	Percent of BAOT	Hours per trip	Max Daily Hours	B(a)P in gasoline	B(a)P in exhaust	Total B(a)P	Napthalene	1-methyl Napthalene	Benzene	MTBE	Total B(a)P Arizona Fish consumption	Total B(a)P HH criteria	Benzene HH criteria	
Outboard Engines														
Carbureted 2-stroke	3.5	2.3	332	450	8	459	182	516	208	7	3,211	1,460	22,546	
Direct Injection 2-stroke	4.5	2.9	548	74	1	76	30	85	34	1	530	241	3,724	
Elec. Fuel Injection 2-stroke	4.5	2.9	548	74	1	76	30	85	34	1	530	241	3,724	
Carb. or EFI 4-stroke	8.9	0.0	0	0	0	0	0	0	0	0	0	0	0	
Inboard/Stern-drive														
Carb. or EFI 4-stroke	72.3	4.7	14,382	1,954	36	1,990	788	2,239	903	29	13,930	6,332	97,799	
Jet gas 4-stroke	4.1	4.0	689	94	2	95	38	107	43	1	667	303	4,684	
Outboard Auxiliary Sail	2.3	3.6	345	47	1	48	19	54	22	1	334	152	2,348	
Personal Watercraft														
Carbureted 2-stroke	0.0	2.4	0	0	0	0	0	0	0	0	0	0	0	
Direct Injection 2-stroke	0.0	2.7	0	0	0	0	0	0	0	0	0	0	0	
4-stroke	0.0	2.7	0	0	0	0	0	0	0	0	0	0	0	
Totals	Total 2 stroke carbureted PWC			0	0	0	0	0	0	0	0	0	0	
	Total all PWC			0	0	0	0	0	0	0	0	0	0	
	Total all 2 stroke carbureted engines			450	8	459	182	516	208	7	3,211	1,460	22,546	
	Total all other engines			2,243	41	2,285	904	2,570	1,036	33	15,993	7,269	112,279	
	Total all engines			2,694	50	2,743	1,086	3,087	1,245	39	19,204	8,729	134,824	
Using BAOT of 4.201														

TABLE H-3: LAKE MOHAVE SURFACE WATER QUALITY ANALYSIS—ALTERNATIVE A—2004
THRESHOLD VOLUME CALCULATIONS IN ACRE-FEET

Engine Type	Percent of BAOT	Hours per trip	Max Daily Hours	B(a)P in gasoline	B(a)P in exhaust	Total B(a)P	Napthalene	1-methyl Napthalene	Benzene	MTBE	Total B(a)P Arizona Fish consumption	Total B(a)P HH criteria	Benzene HH criteria
Outboard Engines													
Carbureted 2-stroke	18.8	2.9	976	1,326	24	1,350	534	1,519	613	19	9,452	4,296	66,357
Direct Injection 2-stroke	2.6	3.3	151	21	0	21	8	24	9	0	146	67	1,028
Elec. Fuel Injection 2-stroke	2.6	3.3	151	21	0	21	8	24	9	0	146	67	1,028
Carb. or EFI 4-stroke	5.1	3.3	302	41	1	42	17	47	19	1	293	133	2,056
Inboard/Sterndrive													
Carb. or EFI 4-stroke	57.0	3.9	3,953	537	10	547	217	615	248	8	3,829	1,741	26,884
Jet gas 4-stroke	14.0	2.4	604	82	2	84	33	94	38	1	585	266	4,105
Outboard Auxiliary Sail	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0
Personal Watercraft													
Carbureted 2-stroke	0.0	2.5	0	0	0	0	0	0	0	0	0	0	0
Direct Injection 2-stroke	0.0	4.8	0	0	0	0	0	0	0	0	0	0	0
4-stroke	0.0	4.8	0	0	0	0	0	0	0	0	0	0	0
Totals	Total 2 stroke carbureted PWC			0	0	0	0	0	0	0	0	0	0
	Total all PWC			0	0	0	0	0	0	0	0	0	0
	Total all 2 stroke carbureted engines			1,326	24	1,350	534	1,519	613	19	9,452	4,296	66,357
	Total all other engines			701	13	714	283	804	324	10	5,000	2,273	35,101
	Total all engines			2,027	37	2,065	817	2,323	937	30	14,452	6,569	101,458
Using BAOT of 1,774													

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THRESHOLD VOLUME CALCULATIONS IN GROSS TONS													
Engine Type	Percent of BAOT	Hours per trip	Max Daily Hours	B(a)P in gasoline	B(a)P in exhaust	Total B(a)P	Napthalene	1-methyl Napthalene	Benzene	MTBE	Total B(a)P Arizona Fish consumption	Total B(a)P HH criteria	Benzene HH criteria
Outboard Engines													
Carbureted 2-stroke	10.0	2.9	518	704	13	716	284	806	325	10	5,015	2,280	35,210
Direct Injection 2-stroke	4.8	3.3	281	38	1	39	15	44	18	1	272	124	1,912
Elec. Fuel Injection 2-stroke	4.8	3.3	281	38	1	39	15	44	18	1	272	124	1,912
Carb. or EFI 4-stroke	9.5	3.3	562	76	1	78	31	88	35	1	545	248	3,823
Inboard/Stern drive													
Carb. or EFI 4-stroke	57.0	3.9	3,953	537	10	547	217	615	248	8	3,829	1,741	26,884
Jet gas 4-stroke	14.0	2.4	604	82	2	84	33	94	38	1	585	266	4,105
Outboard Auxiliary Sail	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0
Personal Watercraft													
Carbureted 2-stroke	0.0	2.5	0	0	0	0	0	0	0	0	0	0	0
Direct Injection 2-stroke	0.0	4.8	0	0	0	0	0	0	0	0	0	0	0
4-stroke	0.0	4.8	0	0	0	0	0	0	0	0	0	0	0
Totals	Total 2 stroke carbureted PWC			0	0	0	0	0	0	0	0	0	0
	Total all PWC			0	0	0	0	0	0	0	0	0	0
	Total all 2 stroke carbureted engines			704	13	716	284	806	325	10	5,015	2,230	35,210
	Total all other engines			772	14	786	311	884	357	11	5,503	2,501	38,635
	Total all engines			1,475	27	1,503	595	1,691	682	22	10,518	4,781	73,845
Using BAOT of 1.774													

TABLE H-5: LAKE MEAD SURFACE WATER QUALITY ANALYSIS—ALTERNATIVE B—2004
THRESHOLD VOLUME CALCULATIONS IN ACRE-FEET

Engine Type	Percent of BAOT	Hours per trip	Max Daily Hours	B(a)P in gasoline	B(a)P in exhaust	Total B(a)P	Napthalene	1-methyl Napthalene	Benzene	MTBE	Total B(a)P Arizona Fish consumption	Total B(a)P HH criteria	Benzene HH criteria
Outboard Engines													
Carbureted 2-stroke	0.0	2.3	0.00	0	0	0	0	0	0	0	0	0	0
Direct Injection 2-stroke	3.9	2.9	338.72	46	1	47	19	53	21	1	328	149	2,303
Elec. Fuel Injection 2-stroke	3.9	2.9	338.72	46	1	47	19	53	21	1	328	149	2,303
Carb. or EFI 4-stroke	7.7	2.9	677.44	92	2	94	37	105	43	1	656	298	4,607
Inboard/Sterndrive													
Carb. or EFI 4-stroke	52.3	4.7	7,434.38	1,010	19	1,029	407	1,157	467	15	7,201	3,273	50,556
Jet gas 4-stroke	3.0	4.0	356.03	48	1	49	19	55	22	1	345	157	2,421
Outboard Auxiliary Sail	1.6	3.6	178.47	24	0	25	10	28	11	0	173	79	1,214
Personal Watercraft													
Carbureted 2-stroke	0.0	2.4	0.00	0	0	0	0	0	0	0	0	0	0
Direct Injection 2-stroke	13.8	2.7	1,107.22	150	3	153	61	172	70	2	1,072	487	7,529
4-stroke	13.8	2.7	1,107.22	150	3	153	61	172	70	2	1,072	487	7,529
Totals	Total 2 stroke carbureted PWC			0	0	0	0	0	0	0	0	0	0
	Total all PWC			301	6	306	121	345	139	4	2,145	975	15,059
	Total all 2 stroke carbureted engines			0	0	0	0	0	0	0	0	0	0
	Total all other engines			1,568	29	1,597	632	1,796	724	23	11,176	5,080	78,463
	Total all engines			1,568	29	1,597	632	1,796	724	23	11,176	5,080	78,463
Using BAOT of 3,000													

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THRESHOLD VOLUME CALCULATIONS IN GROSS TONS													
Engine Type	Percent of BAOT	Hours per trip	Max Daily Hours	B(a)P in gasoline	B(a)P in exhaust	Total B(a)P	Napthalene	1-methyl Napthalene	Benzene	MTBE	Total B(a)P Arizona Fish consumption	Total B(a)P HH criteria	Benzene HH criteria
Outboard Engines													
Carbureted 2-stroke	0.0	2.3	0.00	0	0	0	0	0	0	0	0	0	0
Direct Injection 2-stroke	3.9	2.9	338.72	46	1	47	19	53	21	1	328	149	2,303
Elec. Fuel Injection 2-stroke	3.9	2.9	338.72	46	1	47	19	53	21	1	328	149	2,303
Carb. or EFI 4-stroke	7.7	2.9	677.44	92	2	94	37	105	43	1	656	298	4,607
Inboard/Sterndrive													
Carb. or EFI 4-stroke	52.3	4.7	7,434.38	1,010	19	1,029	407	1,157	467	15	7,201	3,273	50,556
Jet gas 4-stroke	3.0	4.0	356.03	48	1	49	19	55	22	1	345	157	2,421
Outboard Auxiliary Sail	1.6	3.6	178.47	24	0	25	10	28	11	0	173	79	1,214
Personal Watercraft													
Carbureted 2-stroke	0.0	2.4	0.00	0	0	0	0	0	0	0	0	0	0
Direct Injection 2-stroke	13.8	2.7	1,107.22	150	3	153	61	172	70	2	1,072	487	7,529
4-stroke	13.8	2.7	1,107.22	150	3	153	61	172	70	2	1,072	487	7,529
Totals	Total 2 stroke carbureted PWC			0	0	0	0	0	0	0	0	0	0
	Total all PWC			301	6	306	121	345	139	4	2,145	975	15,059
	Total all 2 stroke carbureted engines			0	0	0	0	0	0	0	0	0	0
	Total all other engines			1,568	29	1,597	632	1,796	724	23	11,176	5,080	78,463
	Total all engines			1,568	29	1,597	632	1,796	724	23	11,176	5,080	78,463
Using BAOT of 3,000													

TABLE H-7: LAKE MOHAVE SURFACE WATER QUALITY ANALYSIS—ALTERNATIVE B—2004
THRESHOLD VOLUME CALCULATIONS IN ACRE-FEET

Engine Type	Percent of BAOT	Hours per trip	Max Daily Hours	B(a)P in gasoline	B(a)P in exhaust	Total B(a)P	Napthalene	1-methyl Napthalene	Benzene	MTBE	Total B(a)P Arizona Fish consumption	Total B(a)P HH criteria	Benzene HH criteria
Outboard Engines													
Carbureted 2-stroke	0.0	2.9	0.00	0	0	0	0	0	0	0	0	0	0
Direct Injection 2-stroke	3.2	3.3	149.96	20	0	21	8	23	9	0	145	66	1,020
Elec. Fuel Injection 2-stroke	3.2	3.3	149.96	20	0	21	8	23	9	0	145	66	1,020
Carb. or EFI 4-stroke	6.5	3.3	299.92	41	1	42	16	47	19	1	291	132	2,040
Inboard/Sterndrive													
Carb. or EFI 4-stroke	25.4	3.9	1,385.22	188	3	192	76	216	87	3	1,342	610	9,420
Jet gas 4-stroke	6.2	2.4	211.49	29	1	29	12	33	13	0	205	93	1,438
Outboard Auxiliary Sail	0.0	0.0	0.00	0	0	0	0	0	0	0	0	0	0
Personal Watercraft													
Carbureted 2-stroke	0.0	2.5	0.00	0	0	0	0	0	0	0	0	0	0
Direct Injection 2-stroke	27.7	4.8	1,862.46	253	5	258	102	290	117	4	1,804	820	12,665
4-stroke	27.7	4.8	1,862.46	253	5	258	102	290	117	4	1,804	820	12,665
Totals	Total 2 stroke carbureted PWC			0	0	0	0	0	0	0	0	0	0
	Total all PWC			506	9	515	204	580	234	7	3,608	1,640	25,331
	Total all 2 stroke carbureted engines			0	0	0	0	0	0	0	0	0	0
	Total all other engines			805	15	819	324	922	372	12	5,736	2,607	40,268
	Total all engines			805	15	819	324	922	372	12	5,736	2,607	40,268
Using BAOT of 1,393													

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Engine Type	Percent of BAOT	Hours per trip	Max Daily Hours	B(a)P in gasoline	B(a)P in exhaust	Total B(a)P	Napthalene	1-methyl Napthalene	Benzene	MTBE	Total B(a)P Arizona Fish consumption	Total B(a)P HH criteria	Benzene HH criteria
Outboard Engines													
Carbureted 2-stroke	0.0	2.9	0.00	0	0	0	0	0	0	0	0	0	0
Direct Injection 2-stroke	3.2	3.3	149.96	20	0	21	8	23	9	0	145	66	1,020
Elec. Fuel Injection 2-stroke	3.2	3.3	149.96	20	0	21	8	23	9	0	145	66	1,020
Carb. or EFI 4-stroke	6.5	3.3	299.92	41	1	42	16	47	19	1	291	132	2,040
Inboard/Sterndrive													
Carb. or EFI 4-stroke	25.4	3.9	1,385.22	188	3	192	76	216	87	3	1,342	610	9,420
Jet gas 4-stroke	6.2	2.4	211.49	29	1	29	12	33	13	0	205	93	1,438
Outboard Auxiliary Sail	0.0	0.0	0.00	0	0	0	0	0	0	0	0	0	0
Personal Watercraft													
Carbureted 2-stroke	0.0	2.5	0.00	0	0	0	0	0	0	0	0	0	0
Direct Injection 2-stroke	27.7	4.8	1,862.46	253	5	258	102	290	117	4	1,804	820	12,665
4-stroke	27.7	4.8	1,862.46	253	5	258	102	290	117	4	1,804	820	12,665
Totals	Total 2 stroke carbureted PWC			0	0	0	0	0	0	0	0	0	0
	Total all PWC			506	9	515	204	580	234	7	3,608	1,640	25,331
	Total all 2 stroke carbureted engines			0	0	0	0	0	0	0	0	0	0
	Total all other engines			805	15	819	324	922	372	12	5,736	2,607	40,268
	Total all engines			805	15	819	324	922	372	12	5,736	2,607	40,268
Using BAOT of 1,393													

TABLE H-9: LAKE MEAD SURFACE WATER QUALITY ANALYSIS—ALTERNATIVE C—2004
THRESHOLD VOLUME CALCULATIONS IN ACRE-FEET

Engine Type	Percent of BAOT	Hours per trip	Max Daily Hours	B(a)P in gasoline	B(a)P in exhaust	Total B(a)P	Napthalene	1-methyl Napthalene	Benzene	MTBE	Total B(a)P Arizona Fish consumption	Total B(a)P HH criteria	Benzene HH criteria
Outboard Engines													
Carbureted 2-stroke	4.8	2.3	355	482	9	491	194	552	223	7	3,436	1,562	24,124
Direct Injection 2-stroke	2.7	2.9	257	35	1	36	14	40	16	1	249	113	1,747
Elec. Fuel Injection 2-stroke	2.7	2.9	257	35	1	36	14	40	16	1	249	113	1,747
Carb. or EFI 4-stroke	5.3	2.9	514	70	1	71	28	80	32	1	498	226	3,494
Inboard/Sterndrive													
Carb. or EFI 4-stroke	52.3	4.7	8,165	1,109	20	1,130	447	1,271	513	16	7,909	3,595	55,528
Jet gas 4-stroke	3.0	4.0	391	53	1	54	21	61	25	1	379	172	2,659
Outboard Auxiliary Sail	1.6	3.6	196	27	0	27	11	31	12	0	190	86	1,333
Personal Watercraft													
Carbureted 2-stroke	18.8	2.4	1,514	2,058	38	2,096	829	2,358	951	30	14,669	6,668	102,986
Direct Injection 2-stroke	4.4	2.7	388	53	1	54	21	60	24	1	376	171	2,641
4-stroke	4.4	2.7	388	53	1	54	21	60	24	1	376	171	2,641
Totals	Total 2 stroke carbureted PWC			2,058	38	2,096	829	2,358	951	30	14,669	6,668	102,986
	Total all PWC			2,163	40	2,203	872	2,479	999	32	15,422	7,010	108,269
	Total all 2 stroke carbureted engines			2,540	47	2,587	1,024	2,910	1,173	37	18,106	8,230	127,111
	Total all other engines			1,434	26	1,461	578	1,644	663	21	10,226	4,648	71,789
	Total all engines			3,974	73	4,047	1,602	4,554	1,836	58	28,331	12,878	198,900
Using BAOT of 3,295													

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Engine Type	Percent of BAOT	Hours per trip	Max Daily Hours	B(a)P in gasoline	B(a)P in exhaust	Total B(a)P	Napthalene	1-methyl Napthalene	Benzene	MTBE	Total B(a)P Arizona Fish consumption	Total B(a)P HH criteria	Benzene HH criteria
Outboard Engines													
Carbureted 2-stroke	0.0	2.3	0	0	0	0	0	0	0	0	0	0	0
Direct Injection 2-stroke	3.9	2.9	372	51	1	51	20	58	23	1	360	164	2,530
Elec. Fuel Injection 2-stroke	3.9	2.9	372	51	1	51	20	58	23	1	360	164	2,530
Carb. or EFI 4-stroke	7.7	2.9	744	101	2	103	41	116	47	1	721	328	5,060
Inboard/Sterndrive													
Carb. or EFI 4-stroke	52.3	4.7	8,165	1,109	20	1,130	447	1,271	513	16	7,909	3,595	55,528
Jet gas 4-stroke	3.0	4.0	391	53	1	54	21	61	25	1	379	172	2,659
Outboard Auxiliary Sail	1.6	3.6	196	27	0	27	11	31	12	0	190	86	1,333
Personal Watercraft													
Carbureted 2-stroke	0.0	2.4	0	0	0	0	0	0	0	0	0	0	0
Direct Injection 2-stroke	13.8	2.7	1,216	165	3	168	67	189	76	2	1,178	535	8,270
4-stroke	13.8	2.7	1,216	165	3	168	67	189	76	2	1,178	535	8,270
Totals	Total 2 stroke carbureted PWC			0	0	0	0	0	0	0	0	0	0
	Total all PWC			330	6	337	133	379	153	5	2,356	1,071	16,540
	Total all 2 stroke carbureted engines			0	0	0	0	0	0	0	0	0	0
	Total all other engines			1,722	32	1,754	694	1,973	795	25	12,275	5,580	86,179
	Total all engines			1,722	32	1,754	694	1,973	795	25	12,275	5,580	86,179
Using BAOT of 3,295													

TABLE H-11: LAKE MOHAVE SURFACE WATER QUALITY ANALYSIS—ALTERNATIVE C—2004
THRESHOLD VOLUME CALCULATIONS IN ACRE-FEET

Engine Type	Percent of BAOT	Hours per trip	Max Daily Hours	B(a)P in gasoline	B(a)P in exhaust	Total B(a)P	Napthalene	1-methyl Napthalene	Benzene	MTBE	Total B(a)P Arizona Fish consumption	Total B(a)P HH criteria	Benzene HH criteria
Outboard Engines													
Carbureted 2-stroke	8.4	2.9	432	587	11	598	237	673	271	9	4,184	1,902	29,376
Direct Injection 2-stroke	1.1	3.3	67	9	0	9	4	10	4	0	65	29	455
Elec. Fuel Injection 2-stroke	1.1	3.3	67	9	0	9	4	10	4	0	65	29	455
Carb. or EFI 4-stroke	2.3	3.3	134	18	0	19	7	21	8	0	130	59	910
Inboard/Stern drive													
Carb. or EFI 4-stroke	25.4	3.9	1,750	238	4	242	96	272	110	3	1,695	771	11,902
Jet gas 4-stroke	6.2	2.4	267	36	1	37	15	42	17	1	259	118	1,817
Outboard Auxiliary Sail	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0
Personal Watercraft													
Carbureted 2-stroke	36.5	2.5	1,601	2,176	40	2,216	877	2,493	1,005	32	15,509	7,050	108,884
Direct Injection 2-stroke	9.4	4.8	802	109	2	111	44	125	50	2	777	353	5,453
4-stroke	9.4	4.8	802	109	2	111	44	125	50	2	777	353	5,453
Totals	Total 2 stroke carbureted PWC			2,176	40	2,216	877	2,493	1,005	32	15,509	7,050	108,884
	Total all PWC			2,393	44	2,438	965	2,742	1,106	35	17,063	7,756	119,790
	Total all 2 stroke carbureted engines			2,763	51	2,813	1,113	3,165	1,276	40	19,694	8,952	138,261
	Total all other engines			528	10	538	213	605	244	8	3,767	1,712	26,445
	Total all engines			3,291	61	3,352	1,326	3,771	1,520	48	23,461	10,664	164,706
Using BAOT of 1,760													

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Engine Type	Percent of BAOT	Hours per trip	Max Daily Hours	B(a)P in gasoline	B(a)P in exhaust	Total B(a)P	Napthalene	1-methyl Napthalene	Benzene	MTBE	Total B(a)P Arizona Fish consumption	Total B(a)P HH criteria	Benzene HH criteria
Outboard Engines													
Carbureted 2-stroke	0.0	2.9	0	0	0	0	0	0	0	0	0	0	0
Direct Injection 2-stroke	3.2	3.3	189	26	0	26	10	29	12	0	184	83	1,288
Elec. Fuel Injection 2-stroke	3.2	3.3	189	26	0	26	10	29	12	0	184	83	1,288
Carb. or EFI 4-stroke	6.5	3.3	379	51	1	52	21	59	24	1	367	167	2,577
Inboard/Sterndrive													
Carb. or EFI 4-stroke	25.4	3.9	1,750	238	4	242	96	272	110	3	1,695	771	11,902
Jet gas 4-stroke	6.2	2.4	267	36	1	37	15	42	17	1	259	118	1,817
Outboard Auxiliary Sail	0.0	0.0	0	0	0	0	0	0	0	0	0	0	0
Personal Watercraft													
Carbureted 2-stroke	0.0	2.5	0	0	0	0	0	0	0	0	0	0	0
Direct Injection 2-stroke	27.7	4.8	2,353	320	6	326	129	366	148	5	2,279	1,036	16,002
4-stroke	27.7	4.8	2,353	320	6	326	129	366	148	5	2,279	1,036	16,002
Totals	Total 2 stroke carbureted PWC			0	0	0	0	0	0	0	0	0	0
	Total all PWC			639	12	651	258	733	295	9	4,559	2,072	32,004
	Total all 2 stroke carbureted engines			0	0	0	0	0	0	0	0	0	0
	Total all other engines			1,017	19	1,035	410	1,165	470	15	7,247	3,294	50,877
	Total all engines			1,017	19	1,035	410	1,165	470	15	7,247	3,294	50,877
Using BAOT of 1,760													

TABLE H-13: LAKE MEAD SURFACE WATER QUALITY ANALYSIS—ALTERNATIVE D—2004
THRESHOLD VOLUME CALCULATIONS IN ACRE-FEET

Engine Type	Percent of BAOT	Hours per trip	Max Daily Hours	B(a)P in gasoline	B(a)P in exhaust	Total B(a)P	Napthalene	1-methyl Napthalene	Benzene	MTBE	Total B(a)P Arizona Fish consumption	Total B(a)P HH criteria	Benzene HH criteria
Outboard Engines													
Carbureted 2-stroke	4.8	2.3	402.56	547	10	557	220	627	253	8	3,899	1,772	27,375
Direct Injection 2-stroke	2.7	2.9	291.48	40	1	40	16	45	18	1	282	128	1,982
Elec. Fuel Injection 2-stroke	2.7	2.9	291.48	40	1	40	16	45	18	1	282	128	1,982
Carb. or EFI 4-stroke	5.3	2.9	582.97	79	1	81	32	91	37	1	565	257	3,964
Inboard/Stern Drive													
Carb. or EFI 4-stroke	52.3	4.7	9,265.72	1,259	23	1,282	507	1,443	582	18	8,975	4,080	63,010
Jet gas 4-stroke	3.0	4.0	443.74	603	1	604	24	69	28	1	430	195	3,018
Outboard Auxiliary Sail	1.6	3.6	222.44	30	1	31	12	35	14	0	215	98	1,513
Personal Watercraft													
Carbureted 2-stroke	18.8	2.4	1,718.50	2,335	43	2,378	941	2,675	1,079	34	16,646	7,566	116,864
Direct Injection 2-stroke	4.4	2.7	440.72	60	1	61	24	69	28	1	427	194	2,997
4-stroke	4.4	2.7	440.72	60	1	61	24	69	28	1	427	194	2,997
Totals	Total 2 stroke carbureted PWC			2,335	43	2,378	941	2,675	1,079	34	16,646	7,566	116,864
	Total all PWC			2,455	45	2,500	989	2,813	1,134	36	17,500	7,566	122,858
	Total all 2 stroke carbureted engines			2,882	53	2,935	1,162	3,302	1,331	42	20,545	9,339	144,239
	Total all other engines			2,170	30	2,200	656	1,865	752	24	11,603	5,274	81,463
	Total all engines			5,052	83	5,135	1,818	5,167	2,083	66	32,149	14,613	225,702
Using BAOT of 3,739													

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Engine Type	Percent of BAOT	Hours per trip	Max Daily Hours	B(a)P in gasoline	B(a)P in exhaust	Total B(a)P	Napthalene	1-methyl Napthalene	Benzene	MTBE	Total B(a)P Arizona Fish consumption	Total B(a)P HH criteria	Benzene HH criteria
Outboard Engines													
Carbureted 2-stroke	2.5	2.3	213.60	290	5	296	117	333	134	4	2,069	940	14,526
Direct Injection 2-stroke	3.2	2.9	352.82	48	1	49	19	55	22	1	342	155	2,399
Elec. Fuel Injection 2-stroke	3.2	2.9	352.82	48	1	49	19	55	22	1	342	155	2,399
Carb. or EFI 4-stroke	6.5	2.9	705.64	96	2	98	39	110	44	1	684	311	4,799
Inboard/Sterndrive													
Carb. or EFI 4-stroke	52.3	4.7	9,265.72	1,259	23	1,282	507	1,443	582	18	8,975	4,080	63,010
Jet gas 4-stroke	3.0	4.0	443.74	60	1	61	24	69	28	1	430	195	3,018
Outboard Auxiliary Sail	1.6	3.6	222.44	30	1	31	12	35	14	0	215	98	1,513
Personal Watercraft													
Carbureted 2-stroke	10.0	2.4	911.86	1,239	23	1,262	499	1,420	572	18	8,833	4,015	62,009
Direct Injection 2-stroke	8.8	2.7	881.59	120	2	122	48	137	55	2	854	388	5,995
4-stroke	8.8	2.7	881.59	120	2	122	48	137	55	2	854	388	5,995
Totals	Total 2 stroke carbureted PWC			1,239	23	1,262	499	1,420	572	18	8,833	4,015	62,009
	Total all PWC			1,479	27	1,506	596	1,694	683	22	10,540	4,791	73,999
	Total all 2 stroke carbureted engines			1,529	28	1,557	616	1,752	706	22	10,902	4,955	76,535
	Total all other engines			1,781	33	1,814	718	2,040	823	26	12,695	5,771	89,127
	Total all engines			3,310	61	3,371	1,334	3,793	1,529	48	23,597	10,726	165,662
Using BAOT of 3,739													

TABLE H-15: LAKE MOHAVE SURFACE WATER QUALITY ANALYSIS—ALTERNATIVE D—2004
THRESHOLD VOLUME CALCULATIONS IN ACRE-FEET

Engine Type	Percent of BAOT	Hours per trip	Max Daily Hours	B(a)P in gasoline	B(a)P in exhaust	Total B(a)P	Napthalene	1-methyl Napthalene	Benzene	MTBE	Total B(a)P Arizona Fish consumption	Total B(a)P HH criteria	Benzene HH criteria
Outboard Engines													
Carbureted 2-stroke	8.4	2.9	505.87	687	13	700	277	788	318	10	4,900	2,227	34,400
Direct Injection 2-stroke	1.1	3.3	78.36	11	0	11	4	12	5	0	76	35	533
Elec. Fuel Injection 2-stroke	1.1	3.3	78.36	11	0	11	4	12	5	0	76	35	533
Carb. or EFI 4-stroke	2.3	3.3	156.73	21	0	22	9	24	10	0	152	69	1,066
Inboard/Sterndrive													
Carb. or EFI 4-stroke	25.4	3.9	2,049.49	278	5	284	112	319	129	4	1,985	902	13,937
Jet gas 4-stroke	6.2	2.4	312.91	43	1	43	17	49	20	1	303	138	2,128
Outboard Auxiliary Sail	0.0	0.0	0.00	0	0	0	0	0	0	0	0	0	0
Personal Watercraft													
Carbureted 2-stroke	36.5	2.5	1,875.00	2,548	47	2,595	1,027	2,919	1,177	37	18,162	8,255	127,506
Direct Injection 2-stroke	9.4	4.8	939.01	128	2	130	51	146	59	2	910	413	6,386
4-stroke	9.4	4.8	939.01	128	2	130	51	146	59	2	910	413	6,386
Totals	Total 2 stroke carbureted PWC			2,548	47	2,595	1,027	2,919	1,177	37	18,162	8,255	127,506
	Total all PWC			2,803	52	2,854	1,130	3,211	1,295	41	19,981	9,082	140,277
	Total all 2 stroke carbureted engines			3,235	60	3,295	1,304	3,707	1,495	47	23,062	10,483	161,907
	Total all other engines			619	11	630	249	709	286	9	4,411	2,005	30,968
	Total all engines			3,854	71	3,925	1,553	4,416	1,780	56	27,473	12,488	192,874
Using BAOT of 2,061													

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Engine Type	Percent of BAOT	Hours per trip	Max Daily Hours	B(a)P in gasoline	B(a)P in exhaust	Total B(a)P	Napthalene	1-methyl Napthalene	Benzene	MTBE	Total B(a)P Arizona Fish consumption	Total B(a)P HH criteria	Benzene HH criteria
Outboard Engines													
Carbureted 2-stroke	4.5	2.9	268.42	365	7	371	147	418	168	5	2,600	1,182	18,253
Direct Injection 2-stroke	2.1	3.3	145.72	20	0	20	8	23	9	0	141	64	991
Elec. Fuel Injection 2-stroke	2.1	3.3	145.72	20	0	20	8	23	9	0	141	64	991
Carb. or EFI 4-stroke	4.3	3.3	291.45	40	1	40	16	45	18	1	282	128	1,982
Inboard/Sterndrive													
Carb. or EFI 4-stroke	25.4	3.9	2,049.49	278	5	284	112	319	129	4	1,985	902	13,937
Jet gas 4-stroke	6.2	2.4	312.91	43	1	43	17	49	20	1	303	138	2,128
Outboard Auxilary Sail	0.0	0.0	0.00	0	0	0	0	0	0	0	0	0	0
Personal Watercraft													
Carbureted 2-stroke	19.4	2.5	994.90	1,352	25	1,377	545	1,549	625	20	9,637	4,380	67,656
Direct Injection 2-stroke	18.0	4.8	1,791.68	243	4	248	98	279	112	4	1,735	789	12,184
4-stroke	18.0	4.8	1,791.68	243	4	248	98	279	112	4	1,735	789	12,184
Totals	Total 2 stroke carbureted PWC			1,352	25	1,377	545	1,549	625	20	9,637	4,380	67,656
	Total all PWC			1,839	34	1,873	741	2,107	849	27	13,108	5,958	92,024
	Total all 2 stroke carbureted engines			1,717	32	1,748	692	1,967	793	25	12,237	5,562	85,910
	Total all other engines			887	16	903	358	1,016	410	13	6,324	2,874	44,397
	Total all engines			2,604	48	2,652	1,049	2,983	1,203	38	18,561	8,427	130,307
Using BAOT of 2,061													

TABLE H-17: IMPACTS OF ALL WATERCRAFT ON SURFACE WATER QUALITY - LAKE MEAD

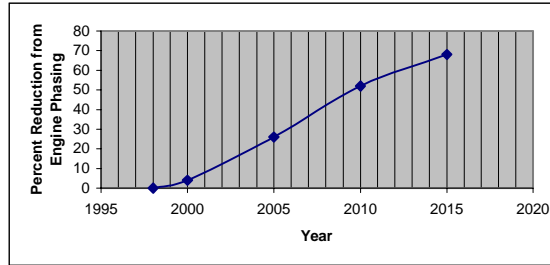
Threshold Volume or Depth of Water Needed to Meet Water Quality Standards Depth at minimum pool (elevation 1150 feet, surface area 112,890 square feet, total volume 16,440,000 af, volume above thermocline 2,085,000 af)									
Alternative - Year	Threshold required to meet standard	ECOLOGICAL BENCHMARK					Arizona Standards for fish consumption	Human Health Criteria	
		Benzo(a)pyrene (fuel and exhaust)	Naphthalene	1-methyl naphthalene	Benzene	MTBE	Benzo(a)pyrene (fuel and exhaust)	Benzo(a)pyrene (fuel and exhaust)	Benzene
Alt A - 2004	AF Depth (ft)	3,248 0.03	1,286 0.01	3,654 0.03	1,473 0.01	47 0.00	22,737 0.20	10,335 0.049	159,627 1.41
Alt A - 2012	AF Depth (ft)	2,743 0.02	1,086 0.01	3,087 0.03	1,245 0.01	39 0.00	19,204 0.17	8,729 0.08	134,824 1.19
Alt B - 2004	AF Depth (ft)	1,597 0.01	632 0.01	1,796 0.02	724 0.01	23 0.00	11,176 0.10	5,080 0.05	78,463 0.07
Alt B - 2012	AF Depth (ft)	1,597 0.01	632 0.01	1,796 0.02	724 0.01	23 0.00	11,176 0.10	5,080 0.05	78,463 0.07
Alt C - 2004	AF Depth (ft)	4,047 0.04	1,602 0.01	4,554 0.04	1,836 0.02	58 0.00	28,331 0.25	12,878 0.11	198,900 1.76
Alt C - 2012	AF Depth (ft)	1,754 0.02	694 0.01	1,973 0.02	795 0.01	25 0.00	12,275 0.11	5,580 0.05	86,179 0.76
Alt D - 2004	AF Depth (ft)	4,593 0.04	1,818 0.02	5,167 0.05	2,083 0.02	66 0.00	32,149 0.28	14,613 0.13	225,702 2.00
Alt D - 2012	AF Depth (ft)	3,371 0.03	1,334 0.01	3,793 0.03	1,529 0.01	48 0.00	23,597 0.21	10,726 0.10	165,662 1.47

TABLE H-18: IMPACTS OF ALL WATERCRAFT ON SURFACE WATER QUALITY - LAKE MOHAVE

Threshold Volume or Depth of Water Needed to Meet Water Quality Standards - All Engine Types Depth at minimum pool (634 feet, surface area 27,455 square feet total volume 1,460,000 af, volume above thermocline 687,800 af)									
Alternative - Year	Threshold required to meet standard	Ecological Benchmark					Arizona Standards for fish consumption Human Health Criteria		
		Benzo(a)pyrene (fuel and exhaust)	Naphthalene	1-methyl naphthalene	Benzene	MTBE	Benzo(a)pyrene (fuel and exhaust)	Benzo(a)pyrene (fuel and exhaust)	Benzene
Alt A - 2004	AF Depth (ft)	2,065 0.08	817 0.03	2,323 0.08	937 0.03	30 0.00	14,452 0.53	6,569 0.24	101,458 3.70
Alt A - 2012	AF Depth (ft)	1,503 0.05	595 0.02	1,691 0.06	682 0.02	22 0.00	10,518 0.38	4,781 0.17	73,845 2.69
Alt B - 2004	AF Depth (ft)	819 0.03	324 0.01	922 0.03	372 0.01	12 0.00	5,736 0.21	2,607 0.09	40,268 1.47
Alt B - 2012	AF Depth (ft)	819 0.03	324 0.01	922 0.03	372 0.01	12 0.00	5,736 0.21	2,607 0.09	40,268 1.47
Alt C - 2004	AF Depth (ft)	3,352 0.12	1,326 0.05	3,771 0.14	1,520 0.06	48 0.00	23,461 0.85	10,664 0.39	164,706 6.00
Alt C - 2012	AF Depth (ft)	1,035 0.04	410 0.01	1,165 0.04	470 0.02	15 0.00	7,247 0.26	3,294 0.12	50,877 1.85
Alt D - 2004	AF Depth (ft)	3,925 0.14	1,553 0.06	4,416 0.16	1,780 0.06	56 0.00	27,473 1.00	12,488 0.45	192,874 7.03
Alt D - 2012	AF Depth (ft)	2,652 0.10	1,049 0.04	2,983 0.11	1,203 0.04	38 0.00	18,561 0.68	8,437 0.31	130,307 4.75

EPA Projected Reduction of carbureted 2-cycle engines

1998	0
2000	4
2005	26
2010	52
2015	68
Interpolated data	
2004	21.6
2012	58.4



To calculate reduction in number of boats in each category of engine in 2004 and 2012

multiply percentage use by .784 for 2004	0.216
multiply percentage use by .416 for 2012	0.584

BAOT

Alternative	Lake Mead	Lake Mohave	Total
A	4,201	1,774	5,975
B	3,000	1,393	4,393
C	3,295	1,760	5,055
D	3,739	2,061	5,800

Source: Alternatives A, B, D - DEIS Table B-3; Alternative C - Jim Holland 8/26/02

Alternative A Trip Distribution

Vessel	Lake Mead					Lake Mohave		
	Baseline %BAOT	Added % Trips replace PWC	% of total trips before phase	phase for 2004 (notes B)	phase for 2012 (notes B)	Baseline %BAOT	Added % Trips replace PWC	% of total trips before phase
Outboard Engines								
Carbureted 2-stroke	6.09	2.32	8.42	6.60	3.50	10.70	13.28	23.9
Direct Injection 2-stroke	2.34	0.89	3.23	3.68	4.46	0.57	0.70	1.2
Elec. Fuel Injection 2-stroke	2.34	0.89	3.23	3.68	4.46	0.57	0.70	1.2
Carb. or EFI 4-stroke	4.67	1.78	6.45	7.36	8.91	1.13	1.41	2.5
Inboard/Stern Drive								
Carb. or EFI 4-stroke	52.33	19.96	72.29	72.29	72.29	25.42	31.55	56.9
2-stroke Carb. Jet Drive	2.98	1.13	4.11	4.11	4.11	6.23	7.73	13.9
Outboard Auxiliary Sail	1.65	0.63	2.28	2.28	2.28	0.00	0.00	0.0
Sub-Total - non-PWC	72.39	27.61	100.00	100.00	100.00	44.62	55.38	100.0
Personal Watercraft								
Carbureted 2-stroke	23.97					46.57		
Direct Injection 2-stroke	1.82					4.41		
4-stroke	1.82					4.41		
Sub-Total - PWC	27.61					55.38		

Note: carbureted two-stroke outboard replaced by other outboard in proportion

Alternative B Trip Distribution

Vessel	Lake Mead	
	2004 and 2012 are the same Baseline %BAOT	Replace outboard and PWC two-stroke - no phasing
Outboard Engines		
Carbureted 2-stroke	6.09	0.00
Direct Injection 2-stroke	2.34	3.86
Elec. Fuel Injection 2-stroke	2.34	3.86
Carb. or EFI 4-stroke	4.67	7.72
Inboard/Stern drive		
Carb. or EFI 4-stroke	52.33	52.33
2-stroke Carb. Jet Drive	2.98	2.98
Outboard Auxiliary Sail	1.65	1.65
Personal Watercraft		
Carbureted 2-stroke	23.97	0.00
Direct Injection 2-stroke	1.82	13.81
4-stroke	1.82	13.81
Total	100.00	100.00

Note: carbureted two-stroke outboard replaced by other outboard in proportion

Lake Mohave

Vessel	2004 and 2012 are the same	
	Baseline %BAOT	Replace outboard and PWC two-stroke - no phasing
Outboard Engines		
Carbureted 2-stroke	10.70	0.00
Direct Injection 2-stroke	0.57	3.24
Elec. Fuel Injection 2-stroke	0.57	3.24
Carb. or EFI 4-stroke	1.13	6.48
Inboard/Stern drive		
Carb. or EFI 4-stroke	25.42	25.42
2-stroke Carb. Jet Drive	6.23	6.23
Outboard Auxiliary Sail	0.00	0.00
Personal Watercraft		
Carbureted 2-stroke	46.57	0.00
Direct Injection 2-stroke	4.41	27.69
4-stroke	4.41	27.69
Total	100.00	100.00

Alternative C Trip Distribution

Vessel	Lake Mead		
	Baseline %BAOT	2004 Phase outboard and PWC two-stroke	2012 Replace outboard and PWC two-stroke
Outboard Engines			
Carbureted 2-stroke	6.09	4.78	0.00
Direct Injection 2-stroke	2.34	2.66	3.86
Elec. Fuel Injection 2-stroke	2.34	2.66	3.86
Carb. or EFI 4-stroke	4.67	5.33	7.72
Inboard/Stern drive			
Carb. or EFI 4-stroke	52.33	52.33	52.33
2-stroke Carb. Jet Drive	2.98	2.98	2.98
Outboard Auxiliary Sail	1.65	1.65	1.65
Personal Watercraft			
Carbureted 2-stroke	23.97	18.79	0.00
Direct Injection 2-stroke	1.82	4.41	13.81
4-stroke	1.82	4.41	13.81
Total	100.00	100.00	100.00

Note: carbureted two-stroke outboard replaced by other outboard in proportion

Lake Mohave

Vessel	2004 and 2012 are the same		
	Baseline %BAOT	2004 Phase outboard and PWC two-stroke	2012 Replace outboard and PWC two-stroke
Outboard Engines			
Carbureted 2-stroke	10.70	8.39	0.00
Direct Injection 2-stroke	0.57	1.14	3.24
Elec. Fuel Injection 2-stroke	0.57	1.14	3.24
Carb. or EFI 4-stroke	1.13	2.29	6.48
Inboard/Stern drive			
Carb. or EFI 4-stroke	25.42	25.42	25.42
2-stroke Carb. Jet Drive	6.23	6.23	6.23
Outboard Auxiliary Sail	0.00	0.00	0.00
Personal Watercraft			
Carbureted 2-stroke	46.57	36.51	0.00
Direct Injection 2-stroke	4.41	9.44	27.69
4-stroke	4.41	9.44	27.69
Total	100.00	100.00	100.00

Alternative D Trip Distribution

Lake Mead			
	Baseline	2004	2012
Vessel	%BAOT	Phase outboard and PWC two-stroke	Phase outboard and PWC two-stroke
Outboard Engines			
Carbureted 2-stroke	6.09	4.78	2.54
Direct Injection 2-stroke	2.34	2.66	3.23
Elec. Fuel Injection 2-stroke	2.34	2.66	3.23
Carb. or EFI 4-stroke	4.67	5.33	6.45
Inboard/Sterndrive			
Carb. or EFI 4-stroke	52.33	52.33	52.33
2-stroke Carb. Jet Drive	2.98	2.98	2.98
Outboard Auxiliary Sail			
	1.65	1.65	1.65
Personal Watercraft			
Carbureted 2-stroke	23.97	18.79	9.97
Direct Injection 2-stroke	1.82	4.41	8.82
4-stroke	1.82	4.41	8.82
Total	100.00	100.00	100.00

Lake Mohave

	2004	2012
Baseline	Phase outboard and PWC two-stroke	Phase outboard and PWC two-stroke
%BAOT		
10.70	8.39	4.45
0.57	1.14	2.13
0.57	1.14	2.13
1.13	2.29	4.26
25.42	25.42	25.42
6.23	6.23	6.23
0.00	0.00	0.00
46.57	36.51	19.37
4.41	9.44	18.00
4.41	9.44	18.00
100.00	100.00	100.00

LAME Current Motorized Watercraft Emissions (Nevada Only)- 2002

Vessel	%BAOT	Number of trips	Total Motor hrs	Hours per trip
Outboard Engines				
Carbureted 2-stroke	6.1	10,029	22,599	2.3
Direct Injection 2-stroke	2.3	3,843	11,245	2.9
Elec. Fuel Injection 2-stroke	2.3	3,843	11,245	2.9
Carb. or EFI 4-stroke	4.7	7,687	22,489	2.9
Inboard/Stern drive				
Carb. or EFI 4-stroke	52.3	86,116	407,808	4.7
Jet gas 4-stroke	3.0	4,896	19,530	4.0
Outboard Auxiliary Sail	1.6	2,711	9,790	3.6
Personal Watercraft				
Carbureted 2-stroke	24.0	39,447	96,474	2.4
Direct Injection 2-stroke	1.8	2,996	8,008	2.7
4-stroke	1.8	2,996	8,008	2.7
Totals	100	164,563	617,195	

Assumptions:

Outboard - Direct injection 2-stroke, EFI 2-stroke, Carb or EFI 4-stroke percentages assume a .25/.25/.50 division of surveyed Outboard Gas, 4 stroke or fuel injected

PWC - Direct injection 2-stroke and 4-stroke assume a 50/50 division of surveyed PWC 4-stroke or fuel injected

Lake Mohave

Vessel	%BAOT	Number of trips	Total Motor hrs	Hours per trip
Outboard Engines				
Carbureted 2-stroke	10.7	2,395	7,009	2.927
Direct Injection 2-stroke	0.6	127	422	3.321
Elec. Fuel Injection 2-stroke	0.6	127	422	3.321
Carb. or EFI 4-stroke	1.1	254	844	3.321
Inboard/Stern drive				
Carb. or EFI 4-stroke	25.4	5,692	22,263	3.911
2-stroke Carb. Jet Drive	6.2	1,395	3,399	2.437
Outboard Auxiliary Sail	0.0	0	0	0.000
Personal Watercraft				
Carbureted 2-stroke	46.6	10,425	25,979	2.492
Direct Injection 2-stroke	4.4	987	4,764	4.829
4-stroke	4.4	987	4,764	4.829
Totals	100.0	22,388	69,864	

Assumptions:

Outboard - Direct injection 2-stroke, EFI 2-stroke, Carb or EFI 4-stroke percentages assume a .25/.25/.50 division of surveyed Outboard Gas, 4 stroke or fuel injected

PWC - Direct injection 2-stroke and 4-stroke assume a 50/50 division of surveyed PWC 4-stroke or fuel injected

Notes:

Percent trip and hours per trip from Hagler-Bailley 1998 survey data
(used in Phasing-Distribution)

Maximum daily hours = BAOT * percent of BAOT * hours per trip

Loading to water and threshold volume calculations are presented in

Appendix G: Approach to Evaluating Surface Water Quality Impacts.

Inboard Jet Gas, four-stroke engines were assumed to be equivalent to four-stroke personal watercraft

Outboard auxillary sail engines assumed to be carbureted 4-stroke outboards.

Calculations for carbureted two-stroke outboard engines and carbureted two-stroke personal watercraft engines followed formulae found in above referenced Appendix G. All other engine types

APPENDIX I: STATES OF NEVADA AND ARIZONA WATER QUALITY STANDARDS

STATE OF NEVADA

NAC 445A.119 to 445A.225 – Codification as of September 2000

NAC 445A.120 Applicability. (NRS 445A.425, 445A.520)

1. NAC 445A.120 to 445A.225, inclusive, apply to all natural streams and lakes, reservoirs or impoundments on natural streams and other specified waterways, unless excepted on the basis of existing irreparable conditions which preclude such use. Man-made waterways, unless otherwise specified, must be protected for public health and the use for which the waterways were developed.
2. The quality of any waters receiving waste discharges must be such that no impairment of the beneficial usage of water occurs as the result of the discharge. Natural water conditions may, on occasion, be outside the limits established by standards. The standards adopted in NAC 445A.120 to 445A.225, inclusive, relate to the condition of waters as affected by discharges relating to the activities of man.

[Environmental Comm'n, Water Pollution Control Reg. § 4.1, eff. 5-2-78]—(NAC A12-3-84; R017-99, 9-27-99)

NAC 445A.121 Standards applicable to all surface waters. (NRS 445A.425, 445A.520)

The following standards are applicable to all surface waters of the state:

1. Waters must be free from substances attributable to domestic or industrial waste or other controllable sources that will settle to form sludge or bottom deposits in amounts sufficient to be unsightly, putrescent or odorous or in amounts sufficient to interfere with any beneficial use of the water.
2. Waters must be free from floating debris, oil, grease, scum and other floating materials attributable to domestic or industrial waste or other controllable sources in amounts sufficient to be unsightly or in amounts sufficient to interfere with any beneficial use of the water.
3. Waters must be free from materials attributable to domestic or industrial waste or other controllable sources in amounts sufficient to produce taste or odor in the water or detectable off-flavor in the flesh of fish or in amounts sufficient to change the existing color, turbidity or other conditions in the receiving stream to such a degree as to create a public nuisance or in amounts sufficient to interfere with any beneficial use of the water.
4. Waters must be free from high temperature, biocides, organisms pathogenic to human beings, toxic, corrosive or other deleterious substances attributable to domestic or industrial waste or other controllable sources at levels or combinations sufficient to be toxic to human, animal, plant or aquatic life or in amounts sufficient to interfere with any beneficial use of the water. Compliance with the provisions of this subsection may be determined in accordance with methods of testing prescribed by the department. If used as an indicator, survival of test organisms must not be significantly less in test water than in control water.
5. If toxic materials are known or suspected by the department to be present in a water, testing for toxicity may be required to determine compliance with the provisions of this section and effluent limitations. The department may specify the method of testing to be used. The failure to determine the presence of toxic materials by testing does not preclude a determination by the department, on the basis of other criteria or methods, that excessive levels of toxic materials are present.

6. Radioactive materials attributable to municipal, industrial or other controllable sources must be the minimum concentrations that are physically and economically feasible to achieve. In no case must materials exceed the limits established in the 1962 Public Health Service Drinking Water Standards (or later amendments) or 1/30th of the MPC values given for continuous occupational exposure in the "National Bureau of Standards Handbook No. 69." The concentrations in water must not result in accumulation of radioactivity in plants or animals that result in a hazard to humans or harm to aquatic life.
7. Wastes from municipal, industrial or other controllable sources containing arsenic, barium, boron, cadmium, chromium, cyanide, fluoride, lead, selenium, silver, copper and zinc that are reasonably amenable to treatment or control must not be discharged untreated or uncontrolled into the waters of Nevada. In addition, the limits for concentrations of the chemical constituents must provide water quality consistent with the mandatory requirements of the 1962 Public Health Service Drinking Water Standards.
8. The specified standards are not considered violated when the natural conditions of the receiving water are outside the established limits, including periods of extreme high or low flow. Where effluents are discharged to such waters, the discharges are not considered a contributor to substandard conditions provided maximum treatment in compliance with permit requirements is maintained.

[Environmental Comm'n, Water Pollution Control Reg. § 4.1.2 subsecs. a-g, eff. 5-2-78]—(NAC A 9-26-90; R017-99, 9-27-99)

NAC 445A.122 Standards applicable to beneficial uses.

1. The following standards are intended to protect both existing and designated beneficial uses and must not be used to prohibit the use of the water as authorized under Title 48 of NRS:
 - a. Watering of livestock. The water must be suitable for the watering of livestock without treatment.
 - b. Irrigation. The water must be suitable for irrigation without treatment.
 - c. Aquatic life. The water must be suitable as a habitat for fish and other aquatic life existing in a body of water. This does not preclude the reestablishment of other fish or aquatic life.
 - d. Recreation involving contact with the water. There must be no evidence of manmade pollution, floating debris, sludge accumulation or similar pollutants.
 - e. Recreation not involving contact with the water. The water must be free from:
 - (1) Visible floating, suspended or settled solids arising from man's activities;
 - (2) Sludge banks;
 - (3) Slime infestation;
 - (4) Heavy growth of attached plants, blooms or high concentrations of plankton, discoloration or excessive acidity or alkalinity that leads to corrosion of boats and docks;
 - (5) Surfactants that foam when the water is agitated or aerated; and
 - (6) Excessive water temperatures.
 - f. Municipal or domestic supply. The water must be capable of being treated by conventional methods of water treatment in order to comply with Nevada's drinking water standards.

APPENDIXES

- g. Industrial supply. The water must be treatable to provide a quality of water which is suitable for the intended use.
 - h. Propagation of wildlife. The water must be suitable for the propagation of wildlife and waterfowl without treatment.
 - i. Waters of extraordinary ecological or aesthetic value. The unique ecological or aesthetic value of the water must be maintained.
 - j. Enhancement of water quality. The water must support natural enhancement or improvement of water quality in any water which is downstream.
2. This section does not entitle an appropriator to require that the source meet his particular requirements for water quality.

[Environmental Comm'n, Water Pollution Control Reg. § 4.1.1, eff. 5-2-78]—(NAC A 11-22-82; 12-3-84; 11-9-95)

NAC 445A.123 Classification and reclassification of waters.

- 1. Stream standards and classifications in NAC 445A.123 to 445A.127, inclusive, do not preclude the commission from establishing standards and classifications for additional public waters nor reclassifying the waters covered by those sections.
- 2. The commission will consider classification of a body of public water not contained in the tables in NAC 445A.123 to 445A.127, inclusive, upon a request for a permit to discharge into that body of water.

[Environmental Comm'n, Water Pollution Control Reg. § 4.2, eff. 5-2-78]—(NAC A 12-3-84)—(Substituted in revision for NAC 445.121)

NAC 445A.193 Colorado River below Hoover Dam.

STANDARDS OF WATER QUALITY

Colorado River

Control Point below Hoover Dam. The limits of this table apply from Lake Mohave Inlet to Hoover Dam.

Parameter	Requirements to Maintain Existing Higher Quality	Water Quality Standards For Beneficial Uses	Beneficial Uses
Temperature °C- Maximum ΔT^a	$\Delta T = 0^\circ\text{C}$	November - April: $\leq 13^\circ\text{C}$ May - June: $\leq 17^\circ\text{C}$ July - October: $\leq 23^\circ\text{C}$ $\Delta T \leq 2^\circ\text{C}$	Aquatic life ^b and water contact recreation.
pH Units	— —	S.V.: 7.0 - 8.3 $\Delta\text{pH}: \pm 0.5$ Max.	Water contact recreation, ^b wildlife propagation, ^b aquatic life, irrigation, stock watering, municipal or domestic supply and industrial supply.
Total Phosphates (as P) - mg/l	A-Avg.: ≤ 0.02 S.V.: ≤ 0.033	A-Avg.: ≤ 0.05 —	Aquatic life, ^b water contact recreation, ^b municipal or domestic supply and noncontact recreation.
Nitrogen Species (N) - mg/l	Total Nitrogen A-Avg.: ≤ 1.0 S.V.: ≤ 1.5	Nitrate S.V.: ≤ 10 Nitrite S.V.: ≤ 0.6 Ammonia S.V.: ≤ 0.2 (un-ionized)	Municipal or domestic supply, ^b aquatic life, ^b water contact recreation, stock watering, wildlife propagation and noncontact recreation.
Dissolved Oxygen - mg/l	— —	S.V.: November - May: ≥ 6.0 June - October: ≥ 5.0	Aquatic life, ^b water contact recreation, wildlife propagation, stock watering, municipal or domestic supply and noncontact recreation.
Suspended Solids - mg/l	— —	S.V.: ≤ 25	Aquatic life. ^b
Turbidity - NTU	— —	S.V.: ≤ 10	Aquatic life ^b and municipal or domestic supply.
Color - PCU	—	^e	Aquatic life ^b and municipal or domestic supply.
Total Dissolved Solids - mg/l	—	^c	Municipal or domestic supply, ^b irrigation and stock watering.
Alkalinity (as CaCO_3) - mg/l	— —	Less than 25% change from natural conditions	Aquatic life ^b and wildlife propagation.
Fecal Coliform - No./100 ml	A.G.M.: ≤ 50 S.V.: ≤ 100	$\leq 200/400^d$	Water contact recreation, ^b noncontact recreation, municipal or domestic supply, irrigation, wildlife propagation and stock watering.

a. Maximum allowable increase in temperature above water temperature at the boundary of an approved mixing zone, but the increase must not cause a violation of the single value standard.

b. The most restrictive beneficial use.

c. The salinity standard for the Colorado River System is specified in NAC 445A.143.

d. Based on the minimum of not less than 5 samples taken over a 30-day period, the fecal coliform bacterial level may not exceed a geometric mean of 200 per 100 ml nor may more than 10 percent of the total samples taken during any 30-day period exceed 400 per 100 ml.

e. Increase in color must not be more than 10 PCU above natural conditions.

(Added to NAC by Environmental Comm'n, 7-31-85, eff. 8-1-85)—(Substituted in revision for NAC 445.13496)

NAC 445A.194 Requirements to maintain existing higher quality for area of Lake Mead; standards for beneficial uses for area not covered by NAC 445A.196. (NRS 445A.425, 445A.520)

1. The requirements to maintain existing higher quality become effective when the existing water quality is higher than the water quality standard for beneficial uses, as determined by the commission. Once the requirements to maintain existing higher quality become effective, the requirements are applicable thereafter. The requirements to maintain existing higher quality for the area of Lake Mead which is not covered by NAC 445A.197 are set forth in NAC 445A.195, and include, without limitation, requirements relating to temperature, pH, chlorophyll a, total dissolved solids, chloride, sulfate, total inorganic nitrogen, turbidity and color.
2. The water quality standards for beneficial uses for the area of Lake Mead which is not covered by NAC 445A.197 are set forth in NAC 445A.195, and include, without limitation, standards relating to temperature, pH, dissolved oxygen, un-ionized ammonia, total dissolved solids, chloride, sulfate, suspended solids, nitrate, nitrite, turbidity, fecal coliform and E. coli. The beneficial uses for this area are:
 - a. Irrigation;
 - b. Watering of livestock;
 - c. Recreation involving contact with the water;
 - d. Recreation not involving contact with the water;
 - e. Industrial supply;
 - f. Municipal or domestic supply, or both;
 - g. Propagation of wildlife; and
 - h. Propagation of aquatic life, including, without limitation, a warmwater fishery.

(Added to NAC by Environmental Comm'n, eff. 11-22-82; A 12-17-87; R062-98, 8-4-98)

NAC 445A.195 Lake Mead excluding area covered by NAC 445A.197. (NRS 445A.425, 445A.520)

LAKE MEAD

Parameter	Requirements To Maintain Existing Higher Quality Water Quality	Standards For Beneficial Uses	Beneficial Uses as Designated in NAC 445A.194 (Most Stringent Use Listed First)
Temperature Single Value	ΔT 0°C ^a	ΔT 2°C ^a	Propagation of aquatic life, including, without limitation, a warmwater fishery.
pH Single Value	95% of samples not to exceed 8.8 SU	Within Range 6.5-9.0 SU	Propagation of aquatic life, including, without limitation, a warmwater fishery, recreation involving contact with water, propagation of wildlife, municipal or domestic supply, or both, industrial supply, irrigation and watering of livestock.
Dissolved Oxygen Single Value	—	≥5 mg/l in the epilimnion or average in water column during periods of nonstratification	Propagation of aquatic life, including, without limitation, a warmwater fishery, watering of livestock, recreation involving contact with water, recreation not involving contact with water, municipal or domestic supply, or both, and propagation of wildlife.
Chlorophyll <i>a</i> —µg/l	^b		Recreation involving contact with water, propagation of aquatic life, including, without limitation, a warmwater fishery, recreation not involving contact with water and municipal or domestic supply, or both.
Un-Ionized Ammonia—mg/l	—	^c	Propagation of aquatic life, including, without limitation, a warmwater fishery.
Total Dissolved Solids Single Value	Flow Weighted Annual Average Concentration ≤723 mg/l measured below Hoover Dam ^d —	— ≤1000 mg/l	Municipal or domestic supply, or both, and irrigation.
Chloride Single Value	^e	≤400 mg/l ^e	Municipal or domestic supply, or both, watering of livestock and propagation of wildlife.
Sulfate Single Value	^e	≤500 mg/l ^e	Municipal or domestic water supply, or both.
Suspended Solids Single Value	—	≤25 mg/l	Propagation of aquatic life, including, without limitation, a warmwater fishery, and recreation not involving contact with water.
Nitrogen Species as N Single Value	Total Inorganic Nitrogen 95% of Samples ≤4.5 mg/l	Nitrate ≤10 mg/l Nitrite ≤1 mg/l	Municipal or domestic supply, or both, watering of livestock, propagation of aquatic life, including, without limitation, a warmwater fishery, and propagation of wildlife.
Turbidity Single Value	^f	≤25 NTU	Propagation of aquatic life, including, without limitation, a warmwater fishery, municipal or domestic supply, or both, recreation involving contact with water and recreation not involving contact with water.
Fecal Coliform		≤200/400 ^g MF or MPN/100 ml	Recreation involving contact with water, irrigation, recreation not

Parameter	Requirements To Maintain Existing Higher Quality Water Quality	Standards For Beneficial Uses	Beneficial Uses as Designated in NAC 445A.194 (Most Stringent Use Listed First)
			involving contact with water, municipal or domestic supply, or both, propagation of wildlife and watering of livestock.
E. Coli 30-day Log Mean Single Value	— —	≤126 MF/100 ml ≤235 MF/100 ml	Recreation involving contact with water, recreation not involving contact with water, municipal or domestic supply, or both, irrigation and watering of livestock.
Color-Pt-Co Units Single Value	^h	—	Recreation not involving contact with water and municipal or domestic supply, or both.

a. Maximum allowable increase in temperature above water temperature at the boundary of an approved mixing zone.

b. The requirements for chlorophyll *a* are:

1. Not more than one monthly mean in a calendar year at Station 3 may exceed 45µg/l.
2. The mean for chlorophyll *a* in summer (July 1–September 30) must not exceed 40 µg/l at Station 3, and the mean for 4 consecutive summer years must not exceed 30 µg/l. The sample must be collected from the center of the channel and must be representative of the top 5 meters of the channel. “Station 3” means the center of the channel at which the depth is from 16 to 18 meters.
3. The mean for chlorophyll *a* in the growing season (April 1–September 30) must not exceed 16 µg/l at LM4 and 9 µg/l at LM5. LM4 is located just outside of the Las Vegas Bay launch ramp and marina, next to buoy RW “1.” LM5 is located next to buoy RW “A” with the southshore landmark of Crescent Island.
4. The mean for chlorophyll *a* in the growing season (April 1–September 30) must not exceed 5 µg/l in the open water of Boulder Basin, Virgin Basin, Gregg Basin and Pierce Basin. The single value must not exceed 10 µg/l for more than 5 percent of the samples.
5. Not less than two samples per month must be collected between the months of March and October. During the months when only one sample is available, that value must be used in place of the monthly mean.

c. See footnote b to NAC 445A.197.

d. The details of this standard are set forth in the “1996 Review-Water Quality Standards for Salinity, Colorado River System” approved by the commission on March 25, 1998.

e. The combination of this constituent with other constituents comprising TDS must not result in the violation of the TDS standards for Lake Mead and the Colorado River.

f. Turbidity must not exceed that characteristic of natural conditions by more than 10 Nephelometric Units.

g. Based on a minimum of not less than five samples taken over a 30-day period, the fecal coliform bacterial level must not exceed a log mean of 200 per 100 ml nor must more than 10 percent of the total samples taken during any 30-day period exceed 400 per 100 ml.

h. Color must not exceed that characteristic of natural conditions by more than 10 units Platinum-Cobalt Scale.

The commission recognizes that at entrances of tributaries to Lake Mead, localized violations of standards may occur.

(Added to NAC by Environmental Comm'n, eff. 11-22-82; A 12-17-87; R062-98, 8-4-98; R017-99, 9-27-99)

NAC 445A.196 Requirements to maintain existing higher quality for area of Lake Mead from western boundary of Las Vegas Bay Campground to confluence of Las Vegas Wash; standards for beneficial uses; goal of requirements and standards. (NRS 445A.425, 445A.520)

1. The requirements to maintain existing higher quality become effective when the existing water quality is higher than the water quality standard for beneficial uses, as determined by the commission. Once the requirements to maintain existing higher quality become effective, the requirements are applicable thereafter. For the area of Lake Mead from the western boundary of the Las Vegas Bay Campground to the confluence of the Las Vegas Wash, the requirements to maintain existing higher quality are set forth in NAC 445A.197, and include, without limitation, requirements relating to temperature, pH, total inorganic nitrogen, total dissolved solids and turbidity.
2. The water quality standards for beneficial uses for Lake Mead from the western boundary of the Las Vegas Bay Campground to the confluence of the Las Vegas Wash are set forth in NAC 445A.197, and include, without limitation, standards relating to temperature, pH, dissolved oxygen, nitrate, nitrite, un-ionized ammonia, total dissolved solids, suspended solids, turbidity and fecal coliform. The beneficial uses for this area are:
 - a. Irrigation;
 - b. Watering of livestock;
 - c. Recreation not involving contact with the water;
 - d. Industrial supply;
 - e. Propagation of wildlife; and
 - f. Propagation of aquatic life, including, without limitation, a warmwater fishery.
3. The goal of the requirements of subsection 1 and the standards of subsection 2 is to ensure that all of Lake Mead is fishable and swimmable by the next triennial review required by the *Clean Water Act*, 33 U.S.C. §§ 1251 et seq.

(Added to NAC by Environmental Comm'n, eff. 11-22-82; A 12-17-87; R062-98, 8-4-98)

NAC 445A.197 Lake Mead from western boundary of Las Vegas Bay Campground to confluence of Las Vegas Wash. (NRS 445A.425, 445A.520) Control point at the Western Boundary of the Las Vegas Bay Campground.

INNER LAS VEGAS BAY

Parameter	Requirements to Maintain Existing Higher Quality	Water Quality Standards for Beneficial Uses	Beneficial Uses as Designated in NAC 445A.196 (Most Stringent Use Listed First)
Temperature Single Value	ΔT 0°C ^a	ΔT 2°C ^a	Propagation of aquatic life, including, without limitation, a warmwater fishery.
pH Single Value	95% of samples not to exceed 8.9 SU	Within Range 6.5-9.0 SU	Propagation of aquatic life, including, without limitation, a warmwater fishery, propagation of wildlife, irrigation, industrial supply and watering of livestock.
Dissolved Oxygen Single Value	—	≥5 mg/l	Propagation of aquatic life, including, without limitation, a warmwater fishery, watering of livestock, recreation not involving contact with water and propagation of wildlife.
Nitrogen Species as Single Value	Total Inorganic Nitrogen 95% of Samples ≤5.3 mg/l	Nitrate ≤90 mg/l Nitrite ≤5 mg/l	Propagation of aquatic life, including, without limitation, a warmwater fishery, watering of livestock and propagation of wildlife.
Un-Ionized Ammonia as N—mg/l	—	^b	Propagation of aquatic life, including, without limitation, a warmwater fishery.
Total Dissolved Solids Single Value	^c	≤3000 mg/l	Watering of livestock and irrigation.
Suspended Solids Single Value	—	≤25 mg/l	Propagation of aquatic life, including, without limitation, a warmwater fishery and recreation not involving contact with water.
Turbidity Single Value	^d	≤25 NTU	Propagation of aquatic life, including, without limitation, a warmwater fishery and recreation not involving contact with water.
Fecal Coliform MF or MPN/100 ml Single Value	—	^e	Propagation of wildlife, recreation not involving contact with water, irrigation and watering of livestock.
<p>a. Maximum allowable increase in temperature above water temperature at the boundary of an approved mixing zone.</p> <p>b. The 4-day average for the concentration of un-ionized ammonia in the vertical column of water and the four-sample rolling average for each interval sampled must not exceed 0.05 mg/l more often than once every 3 years. The daily value for this average must account for diurnal fluctuation. Data must be collected at Station 2 from at least three locations between the surface and total depth. This standard is not applicable to the area between Station 2 and the confluence of the Las Vegas Wash. The single value must not exceed 0.45 mg/l more often than once every 3 years. "Station 2" means the center of the channel at which the depth is 10 meters.</p> <p>c. Any increase in total dissolved solids must not result in a violation of the standards set forth in "1996 Review-Water Quality Standards for Salinity, Colorado River System" approved by the commission on March 25, 1998.</p> <p>d. Turbidity must not exceed that characteristic of natural conditions by more than 10 Nephelometric Units.</p> <p>e. Any discharge from a point source into Las Vegas Wash must not exceed a log mean of 200 per 100 ml based on a minimum of not less than five samples taken over a 30-day period nor may more than 10 percent of the total samples taken during any 30-day period exceed 400 per 100 ml.</p>			

The commission recognizes that, because of discharges of tributaries, localized violations of standards may occur in the inner Las Vegas Bay.

(Added to NAC by Environmental Comm'n, eff. 11-22-82; A 12-17-87; 7-5-94; R062-98, 8-4-98)

NAC 445A.198 Requirements to maintain existing higher quality for area of Las Vegas Wash from Telephone Line Road to confluence of discharges from Clark County and City of Las Vegas wastewater treatment plants; standards for beneficial uses; goal of requirements and standards. (NRS 445A.425, 445A.520)

1. The requirements to maintain existing higher quality become effective when the existing water quality is higher than the water quality standard for beneficial uses, as determined by the commission. Once the requirements to maintain existing higher quality become effective, the requirements are applicable thereafter. For the area of the Las Vegas Wash from Telephone Line Road to the confluence of the discharges from the Clark County wastewater treatment plant and the City of Las Vegas wastewater treatment plant, which encompasses the City of Henderson wastewater treatment plant discharge, the requirements to maintain existing higher quality are set forth in NAC 445A.199, and include, without limitation, requirements relating to temperature, pH, total inorganic nitrogen and total dissolved solids.
2. The water quality standards for beneficial uses for the Las Vegas Wash from Telephone Line Road to the confluence of the discharges from the Clark County wastewater treatment plant and the City of Las Vegas wastewater treatment plant, which encompasses the City of Henderson wastewater treatment plant discharge, are set forth in NAC 445A.199, and include, without limitation, standards relating to pH, dissolved oxygen, nitrate, nitrite, total suspended solids, total dissolved solids and fecal coliform. The beneficial uses for this area are:
 - a. Irrigation;
 - b. Watering of livestock;
 - c. Recreation not involving contact with the water;
 - d. Maintenance of a freshwater marsh;
 - e. Propagation of wildlife; and
 - f. Propagation of aquatic life, excluding fish. This paragraph does not preclude the establishment of a fishery.
3. The goal of the requirements of subsection 1 and the standards of subsection 2 is to ensure that the beneficial uses for the Las Vegas Wash from Telephone Line Road to the confluence of the discharges from the Clark County wastewater treatment plant and the City of Las Vegas wastewater treatment plant, which encompasses the City of Henderson wastewater treatment plant discharge, will include, without limitation, the propagation of aquatic life, including, without limitation, fish by the next triennial review required by the *Clean Water Act*, 33 U.S.C. §§ 1251 et seq.

(Added to NAC by Environmental Comm'n, eff. 11-22-82; A 12-17-87; R062-98, 8-4-98)

NAC 445A.200 Requirements to maintain existing higher quality for area from confluence of Las Vegas Wash with Lake Mead to Telephone Line Road; standards for beneficial uses; goal of requirements and standards. (NRS 445A.425, 445A.520)

1. The requirements to maintain existing higher quality become effective when the existing water quality is higher than the water quality standard for beneficial uses, as determined by the commission. Once the

requirements to maintain existing higher quality become effective, the requirements are applicable thereafter. For the area from the confluence of the Las Vegas Wash with Lake Mead to Telephone Line Road, the requirements to maintain existing higher quality are set forth in NAC 445A.201, and include, without limitation, requirements relating to temperature, pH, total inorganic nitrogen and total dissolved solids.

2. The water quality standards for beneficial uses for the Las Vegas Wash from the confluence of the Las Vegas Wash with Lake Mead to Telephone Line Road are set forth in NAC 445A.201, and include, without limitation, standards relating to pH, dissolved oxygen, nitrate, nitrite, total suspended solids, total dissolved solids and fecal coliform. The beneficial uses for this area are:
 - a. Irrigation;
 - b. Watering of livestock;
 - c. Recreation not involving contact with the water;
 - d. Maintenance of a freshwater marsh;
 - e. Propagation of wildlife; and
 - f. Propagation of aquatic life, excluding fish. This paragraph does not preclude the establishment of a fishery.
3. The goal of the requirements of subsection 1 and the standards of subsection 2 is to ensure that the beneficial uses for the Las Vegas Wash from the confluence of the Las Vegas Wash with Lake Mead to Telephone Line Road will include, without limitation, the propagation of aquatic life, including, without limitation, fish by the next triennial review required by the *Clean Water Act*, 33 U.S.C. §§ 1251 et seq.

(Added to NAC by Environmental Comm'n, eff. 11-22-82; A 12-17-87; R062-98, 8-4-98)

NAC 445A.201 Confluence of Las Vegas Wash with Lake Mead to Telephone Line Road. (NRS 445A.425, 445A.520) The limits in this table apply from the confluence of the Las Vegas Wash with Lake Mead to Telephone Line Road.

LOWER LAS VEGAS WASH

Parameter	Requirements to Maintain Existing Higher Quality Water Quality	Standards for Beneficial Uses	Beneficial Uses as Designated in NAC 445A.200 (Most Stringent Use Listed First)
Temperature Single Value	ΔT 0°C ^a	—	—
pH Single Value		Within Range 6.5-9.0 SU	Propagation of aquatic life, excluding fish, propagation of wildlife, irrigation and watering of livestock.
Dissolved Oxygen mg/l		^b	Propagation of aquatic life, excluding fish, watering of livestock, recreation not involving contact with water and propagation of wildlife.
Nitrogen Species as N Single Value	Total Inorganic Nitrogen 95% of Samples ≤ 17 mg/l	Nitrate ≤ 100 mg/l Nitrite ≤ 10 mg/l	Watering of livestock and propagation of wildlife.
Total Suspended Solids		≤ 135 mg/l ^c	Propagation of aquatic life, excluding fish.
Total Dissolved Solids at 180°C Single Value	95% of samples ≤ 2400 mg/l	≤ 3000 mg/l	Watering of livestock, irrigation and maintenance of a freshwater marsh.
Fecal Coliform MF or MPN/100 ml	—	^d	Recreation not involving contact with water, propagation of wildlife, irrigation and watering of livestock.
<p>a. Maximum allowable increase in temperature above receiving water temperature at the boundary of an approved mixing zone.</p> <p>b. Aerobic conditions are desirable for the beneficial uses of propagation of aquatic life, excluding fish, watering of livestock, recreation not involving contact with the water and propagation of wildlife. So as not to prevent the development and restoration of marshes and wetlands in the Wash, aerobic conditions are established as a goal rather than a standard and the goal is not intended to preclude development of a limited fishery in selected areas. Aerobic conditions is intended to mean the absence of objectionable odors that may be caused by wastewater discharges in excess of existing odors.</p> <p>c. This standard does not apply when flows are greater than 110 percent of average flow as measured at the nearest gage. As used in this paragraph, "average flow" means the 12-month rolling average of the average monthly flow.</p> <p>d. Any discharge from a point source into Las Vegas Wash must not exceed a log mean of 200 per 100 ml based on a minimum of not less than five samples taken over a 30-day period nor may more than 10 percent of the total samples taken during any 30-day period exceed 400 per 100 ml.</p>			

[Environmental Comm'n, Water Pollution Control Reg. part § 4.2.5, Table 47, eff. 5-2-78; A 1-25-79; 8-28-79; 1-25-80; 12-3-80]—(NAC A 11-22-82; R062-98, 8-4-98)

STATE OF ARIZONA

A complete listing of water quality criteria for Arizona is available on the Internet @ http://www.sosaz.com/public_services/Title_18/18-11.htm

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As the nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering wise use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historic places, and providing for the enjoyment of life through outdoor recreation. The department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people. The department also promotes the goals of the Take Pride in America campaign by encouraging stewardship and citizen responsibility for the public lands and promoting citizen participation in their care. The department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

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